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PART II.

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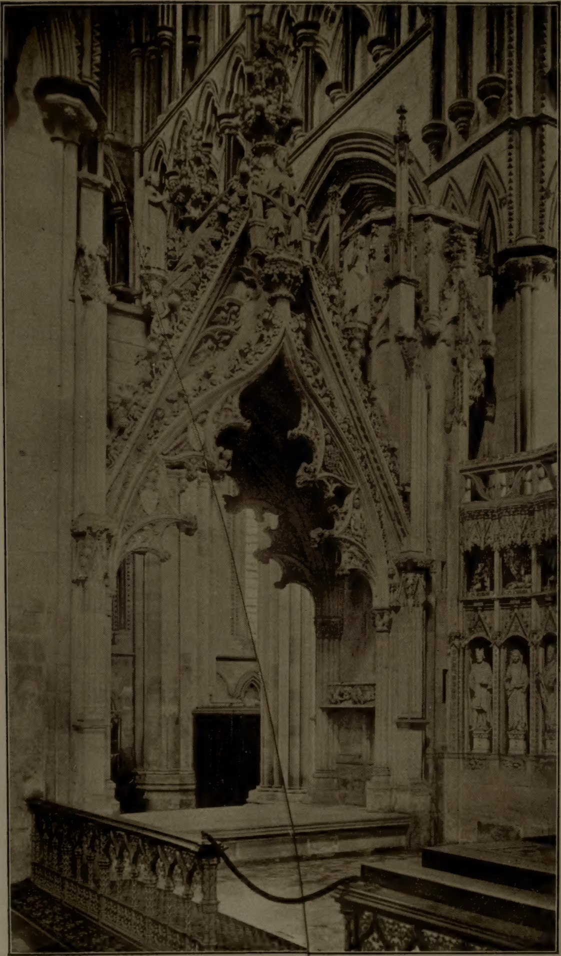

Photo. by H. T. Edwards.

Beverley. Percy Shrine.

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THE ANTIQUARIES' PRIMERS.

English Mediæval Architecture.

IN TWO PARTS.

BY

CYRIL E. POWER, A.R.I.B.A.,

Soane Medallist, Royal Institute of British Architects.

PART II.

With Four hundred and twenty-four Illustrations.

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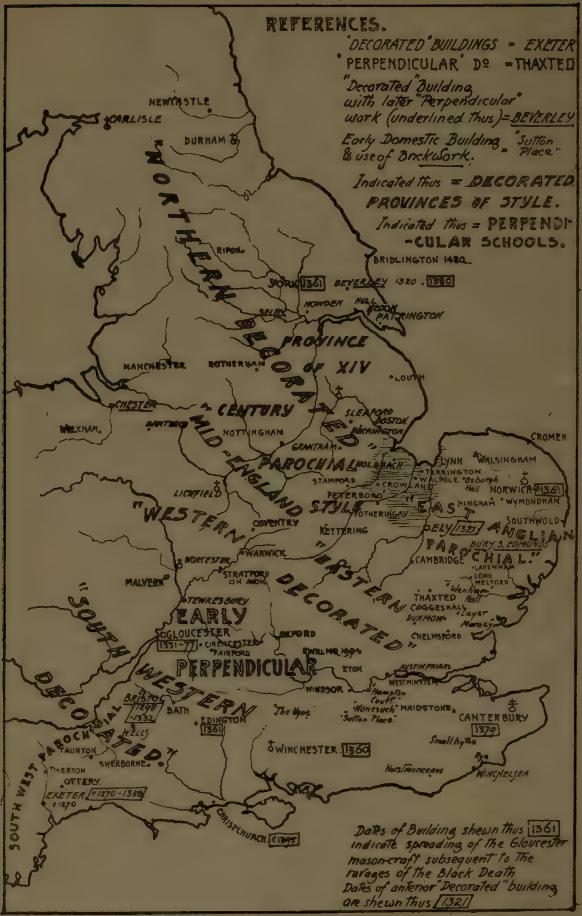

FIG. 192.—Map of Decorated and Perpendicular Building.

CHAPTER X.

Decorated Period, *c.* 1300—1350.

General Survey.—By way of reaction from the strenuous and austere character of national life under the vigorous rule of Edward I, the principal factors which went to condition the development of Architecture during the first half of the XIVth century were, the lavish ostentation and extravagance of the Court under Edward II, which affected baronage and aristocracy, who in turn, stimulated by the martial exploits of the war with France, spread the cult of knightly feat and achievement. Chivalry in all its pomp and splendour paraded itself everywhere, and infected even the ecclesiastic and monastic communities in their feudal aspect.

The visible attributes of knightly rank, of charged shield and crested helm, badge and motto, were sought by all.

This contemporary luxury and social elegance, owing to the increased standard of refinement and comfort after the rather barbaric splendour of earlier periods, is reflected in the architecture; the suave serenity of the XIIIth-century building breaks forth in the exuberant reiteration of crowded ornament and interminable repetition of constructional features, in miniature form, which marks the work of the XIVth-century architecture. The ranged rhythm of the wall arcadings of the last century now give place to the fevered piling up of niche and tabernacle work, which forms the principal decorative *motif* of the period.

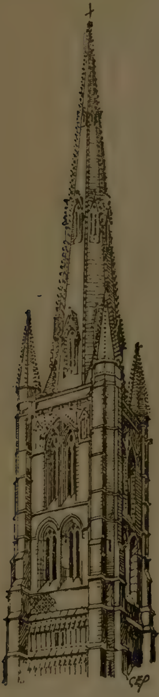

FIG. 193. Grantham; Spire with Parapet, Broach and Pinnacles.

Under the rule of Edward III, the country was very prosperous, and the period antecedent to the Black Death was one of great building and activity. Not only in cathedral and abbey, but far more notably still was this manifested in the rebuilding and enlargement of parish churches, which testifies to the prosperity of the rising middle classes.

Parish church design had been modified and improved during the last century, but the contemporary work at churches such as Heckington, Holbeach, Patrington, Boston, Hull, and the like, raises them to a rank of almost equal to monastic or collegiate importance.

Another result of this progress in our architecture was, that owing to the Hundred Years' War, in many parts of France architecture came to practically a standstill, and the Curvilinear forms of our Decorated architecture, introduced by the English occupation of French territory, were the forms and *motifs* which French masons availed themselves of and further elaborated in their XVth-century Flamboyant Gothic, so called from its flame-like tracery, while by that time we had discarded them in favour of our own insular and rectangular Perpendicular. But it is only recently and grudgingly that French archæologists have been forced to admit this.

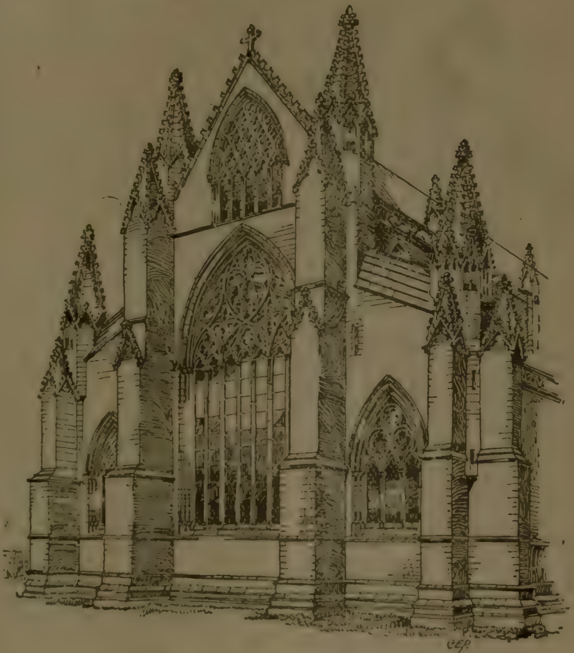

FIG. 194.—Selby, East Front.
Expansion of Window and piling up of Abutment.

The Black Death.—The devastation, wrought by the Black Death in 1349, rudely broke in upon the riotous splendour of contemporary life.

All classes were affected by it; but in its results its importance chiefly lay in the attention thus called to the value of the middle, producing, and trading classes to the community at large.

While king, noble, prelate and monk, had been busily plotting and counter-plotting in the affairs of State, the merchants had been quietly and slowly building up the trade and commerce of the country, and strengthening their position.

The labourer, once the worth of his humble services were recognised in the decimated population, owing to the scarcity of his class, found himself in demand, but his ambitions were rudely checked by the Statutes of Labourers.

In like manner, of the bands of masons in the country, many were wiped out, and the architectural progress of the time in all the Curvilinear richness of its bedecked structure was abruptly checked. Consequently the continuous tradition of craft-work received a shock.

The remaining masons, however, were fortunate indeed, for they found their services eagerly sought after, and they themselves received especial privileges.

This is the reason why the local school of masoncraft, at Gloucester, immediately takes the central position in the mid-XIVth century, as this district would seem to have been largely free from plague visitations. Great works were in progress here at the Abbey of St. Peter: first in the south aisle of the nave, then in the transepts and choir, and a new form of constructional expression was evolved, and from hence radiated the newly-born art in all directions, as we shall see later.

This *Perpendicular* work, as we call it, quickly superseded the Curvilinear and Decorated manner, and so swift a transformation was the result of these economic conditions ensuing on the Black Death.

Aspect.—But this is to anticipate. This drastic change was not as yet, and before it came were many

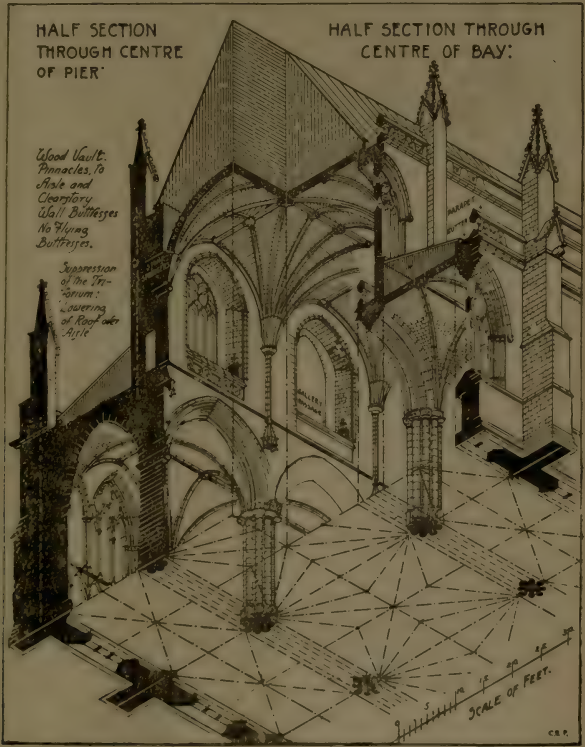
HALF SECTION THROUGH CENTRE OF PIER.
HALF SECTION THROUGH CENTRE OF BAY:
Wood Vault. Pinnacles, to Aisle and Clearstory Wall Buttresses No Flying Buttresses.
Suppression of the Triforium: Lowering of Roof over Aisle
PARAPET
GUTTER
GALLERY PASSAGE
0
5
10
15
20
25
30
SCALE OF FEET.
C.E.P.

FIG. 195.—Selby Choir. Isometric Diagram of Structure.

gracious and sunny triumphs achieved at Exeter, Ely, and elsewhere.

The period from 1300 to 1350, which we shall next consider, corresponds roughly to the Decorated of Rickman and the Curvilinear of Sharpe. Besides the introduction of the reversed or ogee curve, which is the special mark of the period in abacus and mouldings, canopy, line, and setting out of tracery "form pieces," many other distinctive features mark this off from the character of the preceding and subsequent work. The independent marble monoliths of the southern type of pier are superseded by the northern pier with its clusterings of engaged shafts.

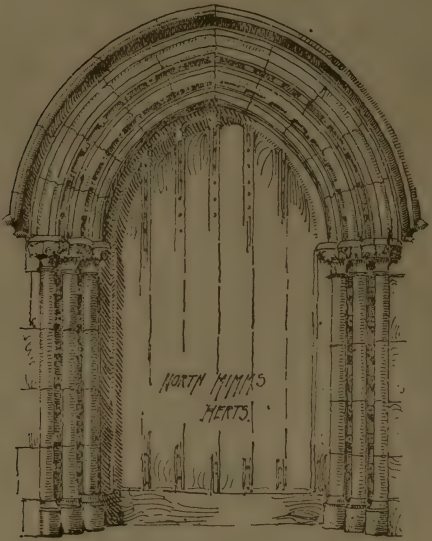

FIG. 196.—Decorated Door.

Interest in the continuous wall arcade as a decorative *motif* flags, and the niche becomes the pet decoration of the XIVth-century mason, on which he lavishes his ingenuity, to be transferred from wall to window in storied tiers at Gloucester.

Generally, there seems to be a straining after effect, and a discontent with the directness inculcated by the tradition of the XIIIth century. Carving is lavishly employed, bulbous in form, of a bossy texture and sinuous outline. With the disuse of the free-standing shaft comes the discarding of the deeply-chiselled channelling of undercut moulding, the profiles of which had already undergone modification during the Geometric period. (Compare Figs. 188, 219.)

The hollows are more sparely used and with a valuable reserve, and the moulded surfaces are contoured in a swelling roundness in which the use of the ogee and the several varieties of chamfers predominate.

The vault becomes more complex, and the spreading "branches" of the Wells chapter-house are re-echoed in the umbrageous sweep of the vault ribs of Exeter; while the introduction of the lierne rib swiftly produced the complex traceried network of Ely, Tewkesbury, and Gloucester choirs. (Fig. 286.)

Planning.—In planning, except the construction of the great central octagon at Ely, no new developments are to be looked for. Wells elaborated the Salisbury model, Bristol repeated the unaisled presbytery type, Carlisle and Glastonbury prolonged their eastern ends, Lichfield built its lofty apsed Lady chapel and presbytery.

Tewkesbury, in remodelling its eastern end, added a chevet of chapels beyond the Romanesque pillars of its apse.

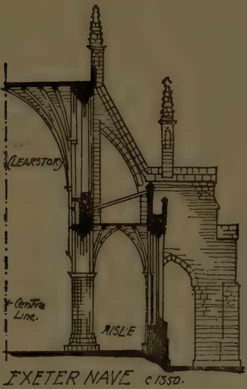

FIG. 197.
Exposed Abutment.

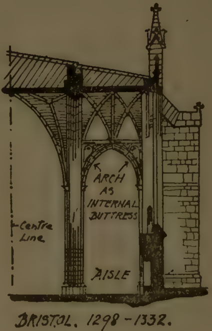

FIG. 198.
Protected Abutment.

The work at Bristol is specially interesting, in that here first appears that which, passing on to Gloucester, was to be later provocative of such startling developments,—the panel in the window tracery, and a system of skeleton stone framework in the vault and mechanism of the structure.

Tracery.—The strictly geometrical character of the setting out and patterning of the late-XIIIth-century tracery often involved somewhat awkward junctions between the component arches, circles, trefoils, and the like, leaving spaces of irregular form.

The introduction and employment of the reversed or ogee curve, with its flowing line, obviated all such difficulties, and the consequent branching growth and interweaving of the tracery bars and mullions becomes distinctive of the first half of the XIVth century. (Fig. 199.)

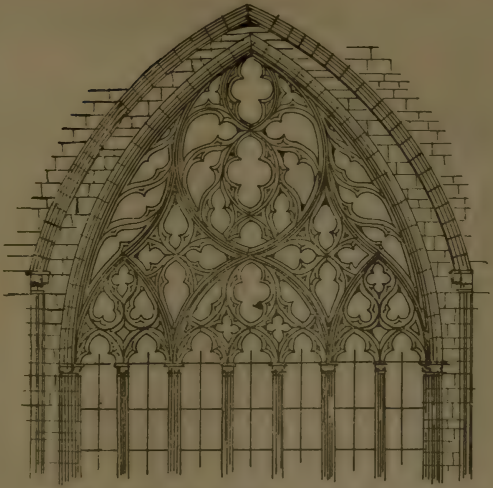

FIG. 199.—Selby East Window. Curvilinear Tracery.

The great east windows of Carlisle Cathedral, Snettisham Church, and the west windows of York Minster, are fine examples of this manner, while Exeter Cathedral furnishes a sequence of examples. Geometrical forms, however, continued in use side by side with the newer method, and combinations of these with Curvilinear *motifs* are far from uncommon, *e.g.*, Tiltey, Lawford, etc.

Ornament.—A purely naturalistic type of foliage ousts the conventional trefoil *c.* 1280, and the carving is marvellous in its technical dexterity and close copying of the natural leaf forms. Briefly, the characteristic of the work is, that the idea of growth of foliage from out of the structure is suppressed, and now entire branches and sprays of leafage are carved on spandrel, cap, and boss, with striking fidelity to nature, and a wondrous display of deft undercutting. Exeter Cathedral and Southwell chapter-house are especially notable for their examples of this type of carving.

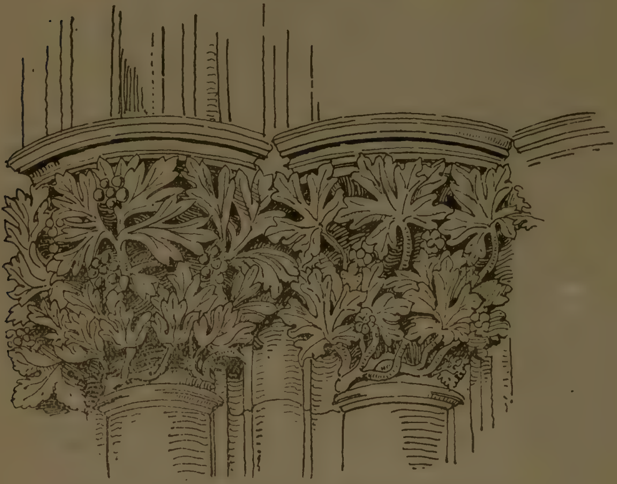

FIG. 200.—Naturalistic Carving. Southwell Chapter-house.

In the XIIIth century, the outline of the bell of the capital was always preserved; now with this wreathing of foliage the capital becomes globular in form, *e.g.*, Patrington, Selby.

This rendering of foliage but lasted for a brief space, and about 1315 the ogee contour begins to appear everywhere in the leafage, and crocket, diaper, finial and spandrel, ripple with undulations and curves This type of carving is distinctive in its sinuous outline and bossiness of surface. The vine, oak, and maple, especially the first, are the staple subject *motifs* of design.

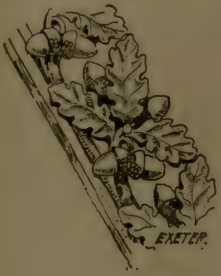

FIG. 201.
Naturalistic Crockets.

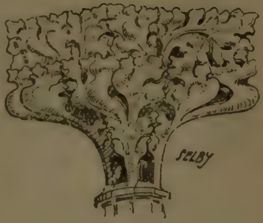

FIG. 202.
Bulbous Finial.

The sedilia at Heckington; the Beverley reredos; and the entire Lady chapel at Ely, teem with examples of this craftsmanship, each leaf and crocket, cap and spandrel, most exquisitely worked. Yet the very redundancy of this crowded ornament palls.

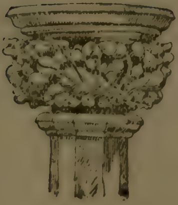

FIG. 203.
Decorated Foliaged Caps.

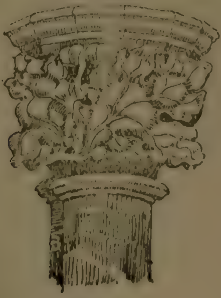

FIG. 204.
Ely Lady Chapel.

Buildings.—The work of the XIVth century opens with that of Bristol choir, where the work is of advanced character, as noted before.

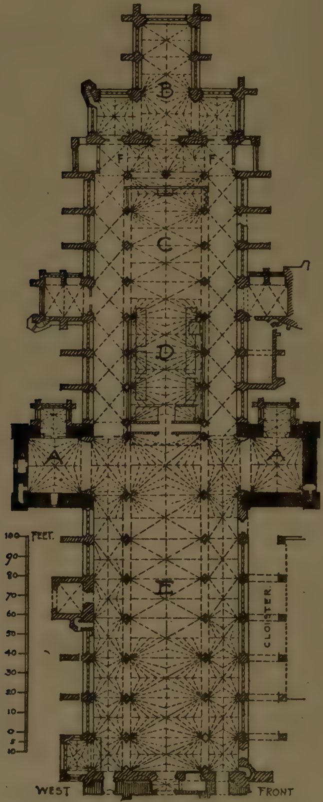

FIG. 205.—Exeter.

With the licenses to crenellate there appear the haughty company of abbey gateways, sign manual of the apparelling of secular state which had now caught the fancy and pride of the monastic communities: examples of such are Kirkham (1296), Canterbury, St. Augustine's (1309); Bury St. Edmunds (1327), the Ely porta of *c.* 1396, on to the stately portals of college and hospital, too numerous to mention, decked out in right lordly array, with pinnacle, battlement and turret, and full many a blazoned shield of patron saint, king and benefactor, punning rebus, and sacred symbol. (Fig. 52.)

But it is at Exeter that we must pause awhile, and all but too briefly survey the radiant glory of the cathedral. (Fig. 205, and Plate, page 177.)

Amongst the English Cathedrals, Exeter is remarkable for the position of its lateral towers, and it was these portions of the Anglo-Norman structure which were suffered to remain during the rebuilding carried on during the late-XIIIth and early-XIVth centuries. Bishop Bronscombe seems to have initiated this reconstruction of the fabric, but it is to Bishop Quivil and his successors, Stapledon, Grandisson, Bitton and Brantingham, that we owe the structure as we see it to-day.

REFERENCES to p. 250:—

EXETER.

A. A.—(1112-36), Towers.
B.—Lady chapel and retrochoir begun *c.* 1270.
A. A.—Transepts remodelled *c.* 1280.
C.—Presbytery (Quivil).
D.—Choir (Bitton).
E.—Nave completed *c.* 1350 (Grandisson); West front, *c.* 1345-99.

With proportions broad and low, and constructionally of modest achievement, internally it commands homage by the unity which knits its frame together. It is rich without fulsomeness, and in the full roundness of its clustered shafting, the modelled surfacing of its moulding, the upspringing grace of its vault structure, it has all the breadth and repose of the XIIIth century, with a superadded rich mellowness of expression which satisfies but surfeits not.

Beverley similar
nave elevation

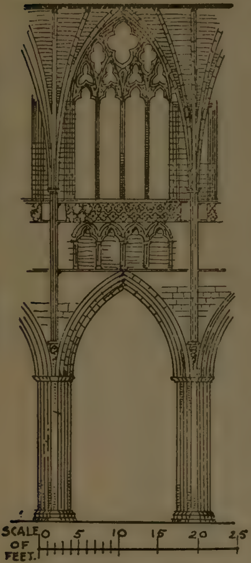

FIG. 206.—Exeter Choir.

Especially notable features are that the triforium is reduced to a mere gallery dominated by the clear-story (Fig. 206), while the proportion of many of the windows is remarkably wide and low; consequently the traceried head of the aperture bears a much larger area relatively to the vertical lights than is usually met with elsewhere.

The dainty minstrels' gallery lends enhanced interest to the nave (Plate, page 177), while in the presbytery and choir are to be found the sedilia and episcopal throne of Stapledon, both sumptuous examples of the pierced and elaborately wrought "tabernacle" work of the period.

Another important example is the nave of Beverley Minster (1320—1349), the ordinance of which, like the consecutive works at Exeter, is largely influenced by the earlier work, and like it is reserved and dignified in aspect. Here especially to be noted is the wild decorative luxuriance of the Percy Shrine and the reredos. (*Frontispiece.*)

The second quarter of the XIVth century was marked by a vast output of building activity, as at Selby choir, Lichfield presbytery, and Worcester nave. Malmesbury vaulted its nave, and Tewkesbury remodelled its choir.

Before this, Wells Cathedral had built its chapter-house and its polygonal Lady chapel by 1326, and then set about the remodelling of the choir and retro-choir (*c.* 1329—1363). The planning of this eastern end is most delightful, and is a finer type of the south-western plan even than Salisbury itself. But within the presbytery exuberance has superseded repose, and in the work, though beautiful in itself, the overlay of feverish ornament tends to weary. A jarring note is struck in the unconstructional ribbing of the vault, which demonstrates a falling away from the honest simplicity and directness of the XIIIth-century traditions. Ornament and fretted richness is introduced for its own sake, and restless ostentation results.

Turning eastwards, we must briefly note the brilliant work in the choir, octagon, and Lady chapel of Ely. The fall of the central tower in 1322 necessitated here, as so often elsewhere, the reconstruction of the adjoining parts, and provided the genius of Alan de Walsingham with his great opportunity.

Instead of rebuilding the central tower again on the narrow intersection of the nave and transepts, he boldly opened out an octagon the full width between the outer aisle walls of the cathedral, with four great arches opening on to nave, choir, and transepts and shorter canted sides, spanning the junction of the aisles with lower arches and tall traceried windows marshalled above. A masterly plan, and one from

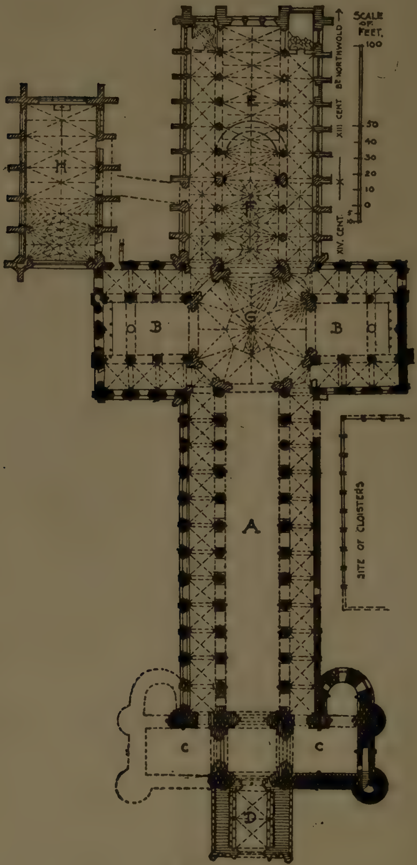

FIG 207.—Ely.

which Sir Christopher Wren drew his inspiration for the planning of the dome of St. Paul's Cathedral in the XVIIth century.

The great central area is canopied by a lofty and very graceful branched vault of wood-ribbing, above which is the octagonal lantern.

In the choir adjoining, the work is not quite so freely progressive, conditioned, as before, by the bay scheme of the Early Norman transepts and nave, and the Lancet presbytery of Bishop Northwold; consequently the triforium is still retained, when elsewhere —at Selby, Exeter, and Lichfield—it had been suppressed.

As at Wells, there is a fulsomeness of ornament which grows rather wearisome, though the lierne vault here is more constructionally progressive and logical. The magnificent Lady chapel adjacent shows the fulness of the structural ideal of the time, and though ornament is lavishly embroidered on the fabric, yet it is withal massed in such a way as to emphasise the constructional parts.

Unhampered by the heavy and oppressive heritage of Romanesque mass, and free from difficulties of abutment, we see here daringly elaborated on a vaster

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REFERENCES to p. 254 :—

ELY.

A.—Nave. }
B. B.—Transepts } (*c.* 1083—*c.* 1130).
C. C.—Western transept. Upper parts (*c.* 1170—*c.* 1200).
D.—Galilee porch, between *c.* 1198 and *c.* 1215.
E.—Presbytery. Bishop Northwold (*c.* 1235—*c.* 1252).
F.—Site of Norman eastern arm. Apse intended but built square-ended.
F.—Choir, }
G.—Octagon, } begun *c.* 1322.
H.—Lady chapel, begun *c.* 1321.

scale, the constructive scheme of the Lady chapels of Chichester and St. Albans, or that of the Chapter-houses of Westminster, Lincoln, and Wells.

The wall is entirely eliminated, and massive buttress piers rise up with wide-spread windows set between. Brooding over all is the overhanging canopy of the intricate lierne vault.

Beneath the note of breadth and spaciousness which is characteristic of the period, one can detect in its very breadth the increasing emphasis of the accent of horizontality and squareness. From the perceptibly depressed curve of the vault of Ely Lady chapel it is but an easy step to that of St. George's, Windsor, King's College Chapel, and the Royal Chapel at Westminster.

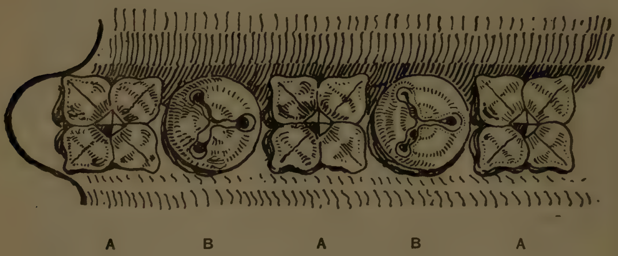


FIG. 208.—Typical Decorated Ornaments.

A. The Four-leaved Flower. B. The Ball Flower.

NOTE.—These are usually arranged in series separately. (See Figs. 216, 218.)

Ranged around the walls, beneath the windows, we see the descendants of the earlier wall arcades, yet no longer arcades, but niches, pinnacled, buttressed, canopied, and crocketed; and the straight gable alternates with the swirling sinuosities of the ogee canopy. Clambering upwards around the piers of the vault the storied niche panels mount higher still. The foliage carving of this wonderful building is still fairly complete, but the gaping niches tell the sad tale of bigoted iconoclasticism and the woeful fate of the imagery. And of the delightful carved reliefs in the spandrels of the wall arcades, many have been mutilated almost beyond recognition.

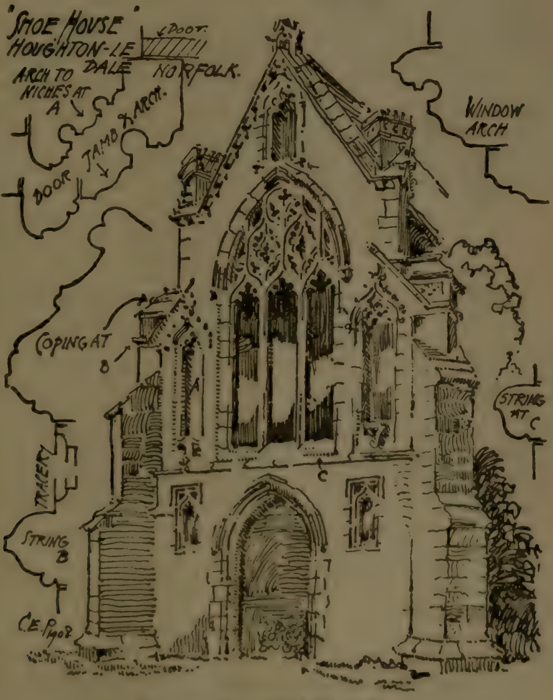


FIG. 209.—Decorated West Front.

The chapel seems now somewhat gaunt, bare and over-lighted, but when in the plenitude of its pristine splendour, with its hierarchy of imagery, its windows glowing with jewelled glass, and the walls warm and pulsating with colour and painted decoration, it must have been wondrous to behold.

Hard by the cathedral is the charming and refined little oratory chapel of Prior Crauden, coeval in date with the great octagon.

The example of Ely craft-work lingered long in East Anglia, where in parish church building Curvilinear tracery forms are retained long after the ubiquitous Gloucester mason and his pupils had stamped the impress of the unbending rectangularity of their art and established its sway over the other local craft schools of England.

Analytical Summary of the Decorated or Curvilinear Period.

CHARACTERISTICS :—

Chivalric.—Period of great building activity.—Elaborately ornate.—Overlay of decoration expressive of secular state.—Great attention paid to detail and accessories.—Creation and use of forms which later reacted on French Architecture, producing "Flamboyant."

ORDINANCE :—

Proportion.

Based on breadth, and feeling for open spaciousness.

Planning.

No novel developments, except Ely octagon. Eastern transept generally goes out of use. Parish church design increases in scale and size. Their pier arcades become lofty and low clear-stories are introduced.

Bay Design—Internal.

Triforium, as a separate story, loses its independence. Jambs of clear-story windows usually descend to the level of the triforium string. Tendency to scheme interiors in two stories.—Lichfield, Selby, Wells. Bristol and Gloucester set out with a one-storied design, with vaulting shafts rising sheer from floor. (Fig. 225.)

Clear-stories.

Continue to increase in importance.

East Fronts.

End windows increase in area, and at Gloucester in Early Perpendicular, this is carried to extremes.

Normal type—high sheer east end of Northern use, with wide and lofty windows to choir and aisles, shouldered by sturdy buttresses. Transept and untowered west fronts treated in a similar manner.

Towers.

The unspired tower begins to become popular.

Spires.

Early-XIVth century—the great period of spire design. The "broach" type gives place to the parapeted spire with angle pinnacles. (Fig. 193.)

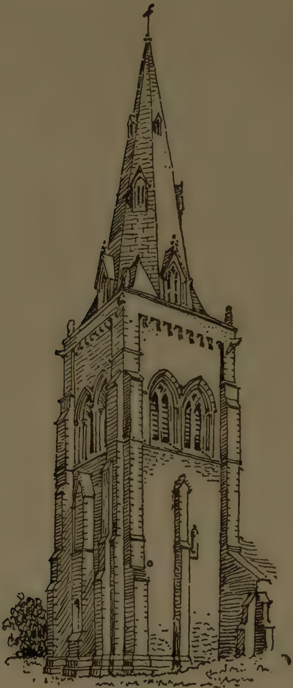


FIG. 210.—Bingham, Notts.
Spire with Broach and Parapet.

CONSTRUCTION :—

Skeleton stone framing introduced at Bristol and Gloucester. At the latter much old work is retained and cased up with new detail, introducing remodelling of structure in place of rebuilding.

Arch.

Usually wide and somewhat low in proportion, varying between equilateral and obtusely pointed profile.

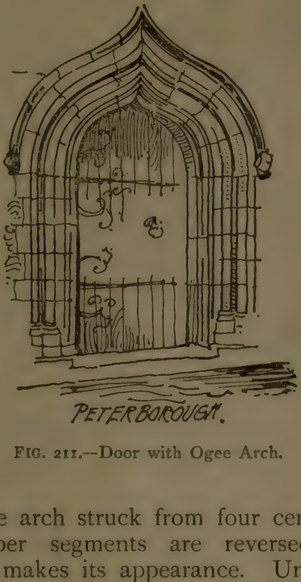


FIG. 211.—Door with Ogee Arch.

The ogee arch struck from four centres, and whose upper segments are reversed curves (Fig. 211), makes its appearance. Unconstructional in form, unsuited to bear heavy loads, its use is limited normally to positions where it is of decorative value in tracery, arcading, foliation, hoods and canopies. (Fig. 199.) Exceptional examples occur of doors, *e.g.*, Peterborough.

This reversed curve is the characteristic decorative sign of the period *c.* 1300—1350.

Vault.

Becomes more intricate with the addition of more tiercerons or branch ribs (Exeter), or liernes (Ely, Gloucester, Tewkesbury).

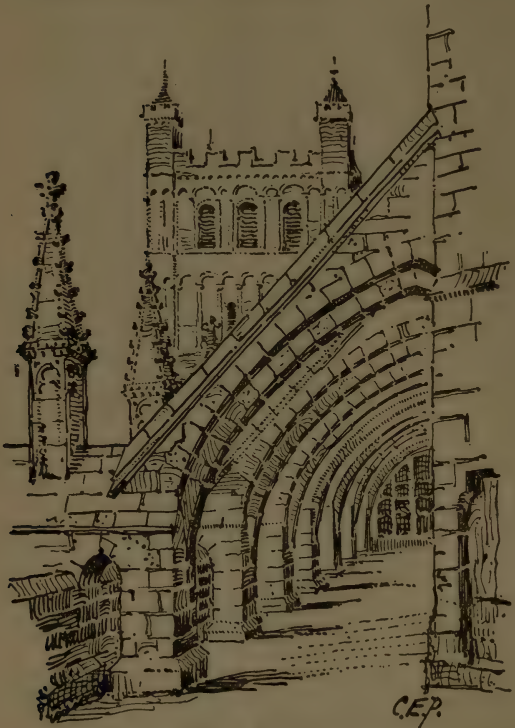


FIG. 212.—Flying Buttresses, Exeter.

Abutment.

Flying buttress, where employed, is exposed above the aisle roof, and becomes lighter in construction and is more skilfully disposed (Exeter, Malmesbury, Wells).

Pinnacle comes into general use to weight upper stages of wall buttress at the springing of the flying buttress, and is accepted as a valuable constructive and decorative adjunct. (Figs. 212, 305.)

Wall buttresses project more, are built in stages, with gabled set-offs, often highly enriched with niches and canopies (York, west front).

A single buttress, placed diagonally, is often substituted for two corner ones, abutting against a salient angle. (Fig. 213.)

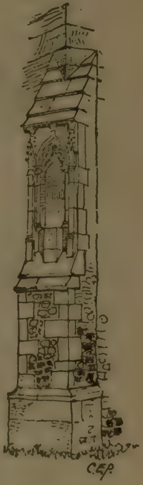


FIG. 213.
Diagonal Buttress.
Colchester,
All Saints.

Piers.

Northern type of pier with clustered engaged columns, *e.g.*, Selby (Fig. 195); or often grouped diamond-wise on plan, Exeter. (See Fig. 141.)

Capitals.

Abacus. Circular or octagonal on plan.

The XIIIth-century *abacus* with undercut hollow, superseded by one with an ogee and small bead. Astragal is an ogee or scroll. (Figs. 158, 186, 386.)

Floriated *caps* are globular and bulbous, the foliage being *wreathed* around bell (Patrington, Ely). (Figs. 200, 203, 204.)

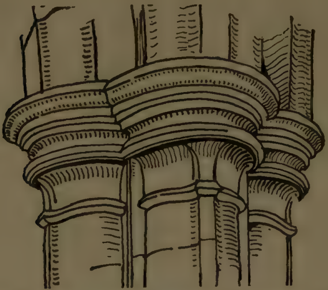


FIG. 214.—Helpringham. Decorated Caps, with Circular Abaci and Filleted Shafts.

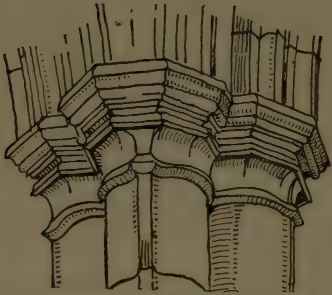


FIG. 215.—Sleaford. Decorated Caps, with Octagonal Abaci.

Bases.

Spread less and begin to rise in height; octagonal plinth comes into use again.

Mouldings are either triple rolls or reversed ogees, and usually overhang upper portion of lower plinth. (Figs. 187, 387.)

Roofs.

Skill in scientific decorative carpentry now develops apace and woodwork evolves its own special technique. (Polebrook. Raunds.)

Wood-framed ceilings, imitating lines of stone vaults, are employed in certain instances: Ely octagon, Selby choir (Fig. 195), St. Albans' presbytery.

Parapets.

Designed on level lines, at first the vertical face is left plain and solid, then is diapered, and finally panelled (Fig. 216) or pierced (Fig. 217).

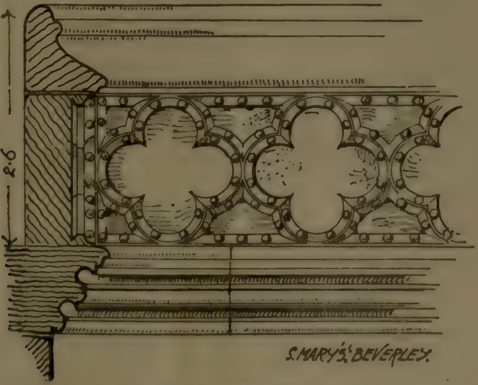


FIG. 216.—Traceried Parapet.

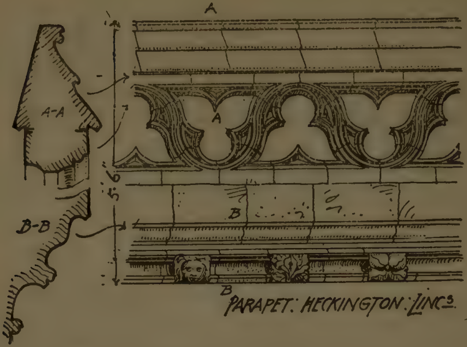


FIG. 217.—Pierced and Traceried Parapet.

Doors.

Jamb shafts are engaged, but tend to become fewer and go out of use; continuous impost of the XIIIth century often discarded, and some of the arch-moulds run right through, down the sides of jamb; and in smaller examples there may be no capitals or shafts when the arch-moulds impinge and die out in the splayed jambs. (Fig. 218.)

Windows.

The introduction of the reversed ogee curve gives a branching and leaf-like character of growth to the tracery. (York, west front; Carlisle, east window.) Tracery bars interpenetrate instead of touching each other at certain points only.

Chamfer cusps supersede soffite cusps, and the foliation of arches, etc., becomes elaborate with compound cusping.

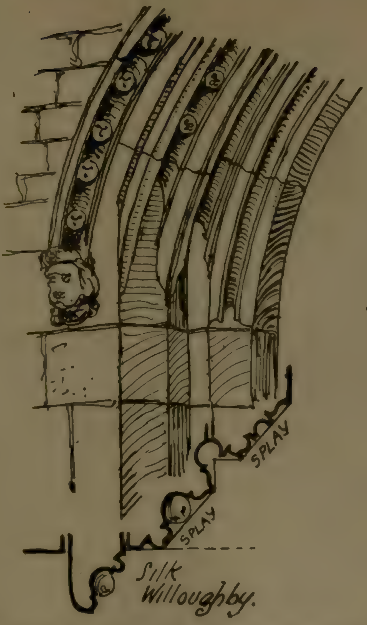


FIG. 218.

"Discontinuous Impost."

Parish church clear-story windows are often only small foliated openings pierced through the wall; circular, triangular, or of square form.

DECORATION :—

Mouldings.

Emphasis of the receding arch orders becomes less marked, and mouldings begin to lie in the chamfer, or diagonal plane.

Large use of various forms of chamfers, ogees, etc., sparing employment of hollows, the rolls become broad and the fillets wide. (Fig. 381.)

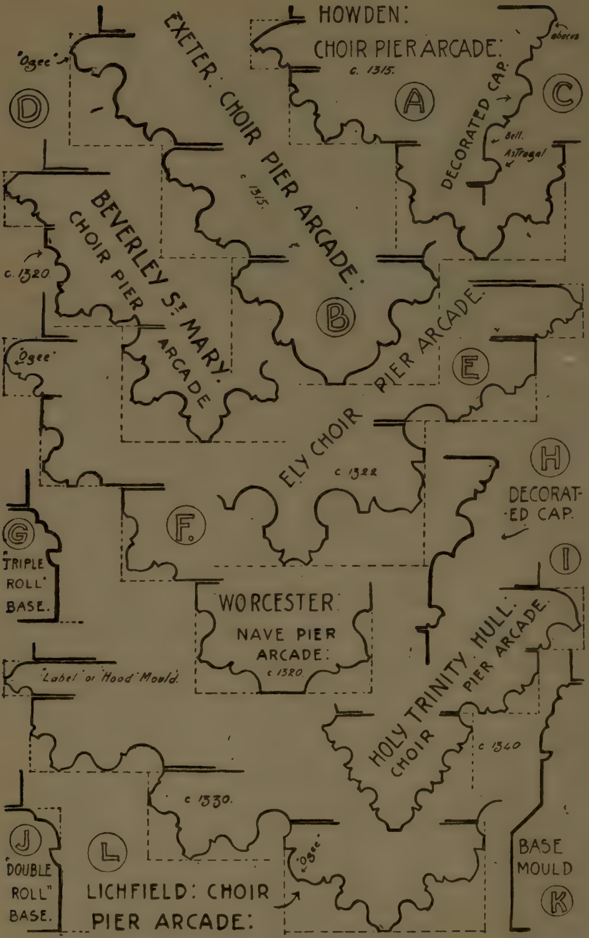


FIG. 219.—Decorated Mouldings.

Ornament.

Typical.—"Ball flower" and the "four-leaved

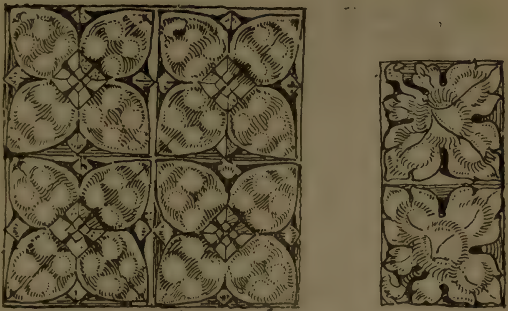


FIG. 220.—Types of Diapered Foliage.

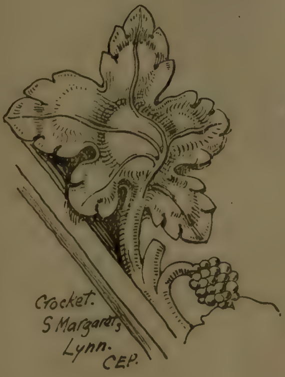


FIG. 221.

Semi-Naturalistic Foliage.

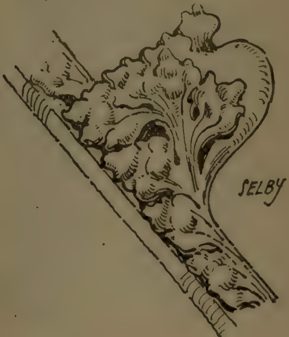


FIG. 222.

Bulbous Foliage.

flower"—these supersede the XIIIth-century "dog-tooth" enrichment.

Prodigal use of flat-carved, diapered patterns, crockets, bulbous finials. (Figs. 202, 220, 222.)

Foliage—oak, maple, vine. In the later years of the XIIIth century, lasting on till after the first decade of the XIVth, foliage is of a peculiarly naturalistic type; highly-finished sprays are carved and applied to spandrel and cap—*e. g.*, Southwell. This is succeeded by characteristic undulatory and bossy carvings, ogee in outline, and of swirling curvature (Ely Lady chapel).

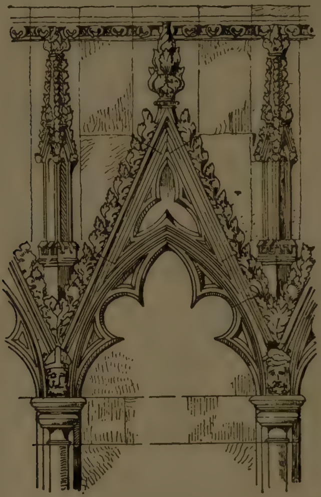


FIG. 223.—Canopied Wall Arcade.
Wells Chapter-house.

Characteristic of ornament—exuberant richness and luxuriance, parade of heraldic devices and symbols of temporal rank, as well as of ecclesiastic and religious purpose.

Typical decorative *motif*—canopied niche.

The treatment of this is developed from the canopied wall arcade of the preceding period.

The niche assumes an infinite variety of forms, ranging from a sunk recess in the wall to complex open, pierced, and piled-up "tabernacle" work with spiky crocketed canopies.

The gable, buttress, and pinnacle in miniature play a large part in decoration.

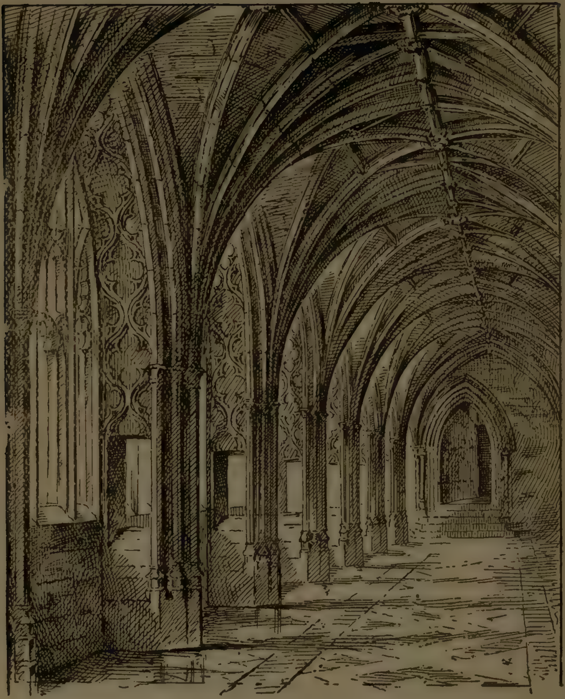


FIG. 224.—Worcester Cloisters. Lierne Vault.

CHAPTER XI.

Perpendicular Period, *c.* 1350—*c.* 1550.

We now pass on to consider the last phase of our English Mediæval Architecture which, perhaps, is the most interesting portion of the Gothic story of these islands. Firstly, from the democratic quality of its art, no longer that of a class,—monk, ecclesiastic, king, or noble,—but more widely representative of the nation as a whole; secondly, arising from its oft, almost unambitious, homely character, expressive of the religious aspirations of the people, and typified in the Parish Church.

Not that its achievements were insignificant; indeed its constructional dexterity in vault and roof astounds us, and was progressive right up to the end, but by its absolute expression of, and conformity with, the needs of the time and means of production.

The reign of this Rectilinear art was long; arising in mid-XIVth century, the years 1350—1400 saw its spread over England. This early or transitional period was followed by its culmination during the XVth century. The early years of the XVIth saw a slight certain admixture of Renaissance ornament introduced in carving and decoration; but the dissolution of the monasteries finally cut its career short and dealt it its death blow, though the Gothic tradition faintly lingered on for some time later.

It will be more convenient then, and preserve the unity of the period, if we deal with the history of

Perpendicular in the mass, as it were, disregarding the centuries.

Firstly, because the decorative aspect of the work broadly remains uniform throughout the period all over the country. East Anglia, Devonshire, Yorkshire, South, North, and West England have each their local vernacular characteristics, yet these, though well marked (to adequately treat of them is outside the scope of this short chapter), are not such as to require any break in our survey.

Secondly, it will be more to the point to group our examples and study each type—church, tower, porch, rather than follow out a completer list in chronological sequence of individual structure.

For the typical examples of buildings illustrative of the period are not to be found in one class alone. We cannot cite Canterbury Cathedral nave, or Sherborne Abbey, or Lavenham Church, as entirely summing up the individuality of the style. For building activity was diffuse in its objects, and these were of so varied a character, and smaller in size and scale, that it will give a better idea of the *ethos* of the period to thus consider each kind separately.

Following on the Black Death came an unsettled period, with widespread social unrest.

The general revolt against the exactions of the propertied classes, which led to the serious peasant rising of 1381, turned the townsfolk and peasants against the church and abbeys—witness the outbreaks at Bury St. Edmunds, Norwich, and St. Albans. It would seem that the Lollards availed themselves of this to direct this class hatred against the Church, while at the same time the nobles and baronage, jealous of the importance of ecclesiastics in the secular offices of the State, were only too willing to make common cause in the matter.

At the same time papal demands and regal exactions indirectly checked progress in ecclesiastical building, owing to the diversion of the available funds to secular purposes.

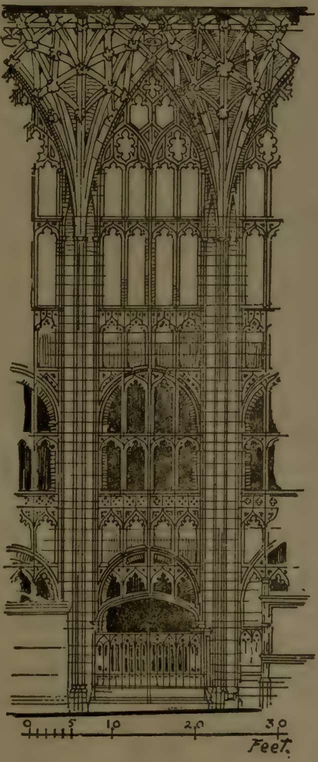


FIG. 225.—Gloucester Choir. Bay Design.

These causes doubtless account for the sudden falling off in the amount of work done in the XVth century as regards ecclesiastical buildings of the first rank.

With the beginning of the XVth century one can detect signs of the change which was to culminate in the XVIth century. Notable is the gradual decay of the power of the aristocracy, whom it had always been the policy of the kings to reduce to subservience, and who under the feudal system could and did exercise, again and again, an armed power to coerce and even overthrow the Crown.

The internecine feuds between the greater nobles during the early Middle Ages had weakened them, and their decline was hastened by the French wars which had been in progress during the greater part of the XIVth century, and which dragged on till the final defeat of the English.

This only served to excite the rivalry of the various factions, and culminated in the Wars of the Roses. With the accession of Henry VII the regal power was consolidated into the despotic rule of Tudor times, and the employment of gunpowder paralysed the might of restless nobles whose castles and fortresses were then rendered useless against a monarch possessed of artillery.

At the same time, during this period of unrest, the middle classes steadily gained in wealth and importance, and in their hands chiefly lay the financial resources which fed the architectural developments of the age.

But apart from Parliamentary representation they had no force to oppose that of the king; it was the policy instituted by Edward IV and carried on by the Tudors, to suppress this and render its power ineffectual, only calling on the votes of the people as an aid to legalise the exactions of the Crown.

In like manner, at this time, neither was the Church as socially and politically important as heretofore. The monastic life had been put out of gear to a great extent by the Black Death, and learning in the convent schools and universities fell somewhat into decay. At the same time culture was spreading, and a taste for literature was developing amongst leisured classes outside monastic circles. Country squires and nobles, such as Humphrey (Duke of Gloucester), Tiptoft (Earl of Worcester), were collecting libraries, and a learning based on a more intimate acquaintance with the works of classic antiquity was diffusing itself abroad. The invention of printing also came to revolutionise intellectual life, putting learning into secular hands, and destroying the quasi-monopoly of culture which the monasteries unselfishly had disseminated broadcast.

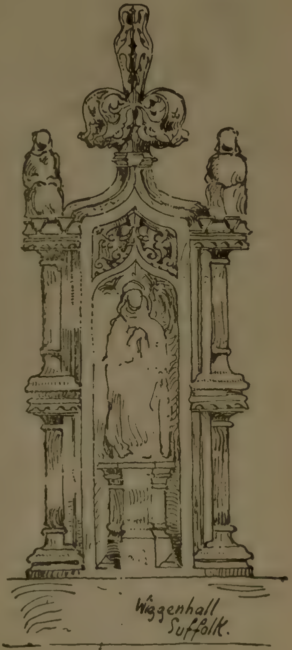


FIG. 226.

Perpendicular Bench End.

Their patient and unremitting toil now bore fruit; but the result was to destroy their own prestige and importance, to limit their energies to the primary spiritual object of their foundation, and to liberate social progress and work from their tutelage.

In like manner the formation of guilds of masons had more far-reaching effect than of merely freeing the craftsmen from ecclesiastic vassalage—monks and clerics who were once patrons, and personally interested, became only clients and customers.

With this secular executive body, and a growing secular class of client or patron, coupled with the ever-rising standard of comfort, comes the shifting of concentration of object from solely ecclesiastical purpose to increasingly domestic ends. Domestic planning and architecture in earlier centuries largely lay in the setting out of kingly, noble and episcopal palaces, and in the providing for the requirements of the monastic cloister, hospital and community life. Now, with the fuller flood of public life, came the need of stately guild-halls and the like, and so likewise the burgess bethought him to improve the material comfort of his dwelling.

The co-ordinance of co-operative effort which had produced the vast abbeys and cathedrals of the XIth, XIIth and XIIIth centuries ceases, and efforts are localised, individual and personal, in purpose and predilection.

The parish church, the guild chapel, and private chantry of wealthy trader, as well as of lineaged lord, are the purposes on which effort is more particularly bent. Moreover, in the previous centuries, so generously had the architectural needs of the times been supplied, that with the slackening tide of art it came about that there was not the need for vast rebuilding, or new foundations as of yore, and it is in lesser additions of tower and porch, clear-story and roof, and fitments of reredos, screen and stall, that XVth- and XVIth-century art exhibits the quaintness of its fancy.

There is the same zeal and lavish generosity, but the scale has shrunk and become limited accordingly as the resources of the individual patron supersede those of the community.

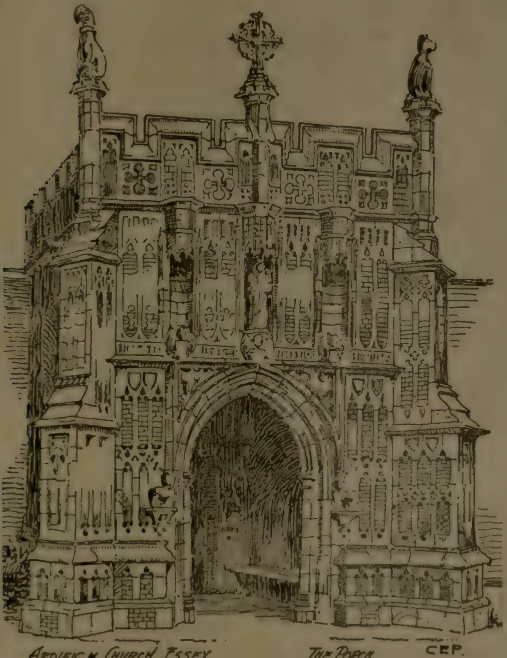

ARDLEIGH CHURCH. ESSEX.
THE PORCH.
CEP.

FIG. 227.—East Anglian Panelled *Flint* Work.

The humble parishioner could now in some measure indulge a taste for æsthetic refinement, as well as the noble or knight, by contributing to the beautification of the parish church.

Many an inscription tells us of these additions, as at Hessett, Suffolk, where "John Hoo and Katryn his wife built ye chapel and repaired ye hile."

So, as the great ecclesiastical architecture declines, so does domestic building come into prominence, as at Cowdray, Penshurst, &c., and anent this, it may be noted that the invention of gunpowder first having rendered feudal fortification obsolete, reacted on the planning of the house.

In castellated architecture the living rooms had been built laagerwise around, and lighted from, an internal court or quadrangle for defensive reasons. Now this enclosed form became unnecessary, and one side of the court is omitted, giving better light and air to the plan; this again becomes E- or H-shaped, and ultimately there was evolved later, in the XVIth and XVIIth centuries, the modern rectangular block plan of domestic house, with the windows looking outwards, *e.g.*, the Queen's House, Greenwich.

THE GLOUCESTER MASON-CRAFT.

The triumphs of the schools of Exeter and Ely were brief, and of evanescent brilliance, and it is idle to speculate as to what their ultimate achievement might have been and how it might have come.

For, as before noted, at the same time the masons at Gloucester were locally fashioning a style the ultimate spreading of which they neither foresaw nor dreamed of. (Refer to Fig. 192.)

The tragic end of Edward II—mysteriously done to death at Berkeley Castle—was the cause which brought about both the opportunity and the means. After his murder, burial could scarce be found for the royal corpse till Abbot Thokey, defying the power of the party of Queen Isabella, boldly interred the remains at Gloucester in 1327.

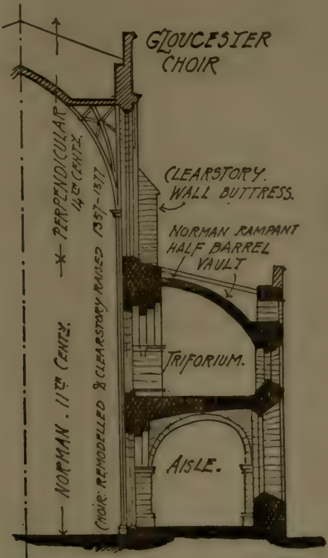

GLOUCESTER CHOIR
CLEARSTORY. WALL BUTTRESS.
NORMAN RAMPANT HALF BARREL VAULT
TRIFORIUM.
AISLE.
PERPENDICULAR 14th CENTY.
NORMAN. 11th CENTY.
CHOIR: REMODELLED & CLEARSTORY RAISED 1357-1377

FIG. 228.—Section, Gloucester Choir.

A reaction of sympathy with the dead king swiftly arose, his misgovernment was forgotten, and his tomb became the centre of pilgrimage, where thousands came and made their offerings. These so enriched the abbey that the remodelling and alteration of the Romanesque structure on a large scale was determined on. (Fig. 59.)

Here Gloucester innovated as much in the quality

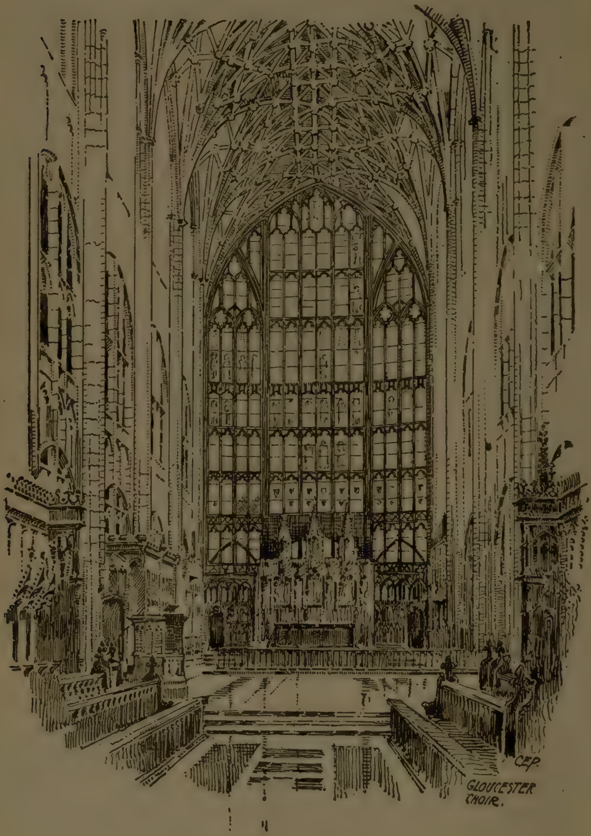


FIG. 229.—Gloucester Choir.

of the decorative forms, as in the methods with which she executed her new constructions. (Figs. 225, 228.)

Previously it had been the usual practice, when extensions were determined on, to bodily pull down the earlier building of whatever date it might be; but here the new school retained large portions of the Norman work in choir and transepts, using this nucleus, recased and garbed with a structural veil of new detail, as the skeleton foundation and framework on and around which the new work was built up. This system was more or less followed in the reconstruction of Tewkesbury choir, Winchester nave, and Norwich choir and elsewhere.

Here at Gloucester the old Norman clear-stories of choir and transepts were pulled down, the ends of the apse and transepts taken out, and on this substratum, as it were, was erected a lofty clear-story supporting the most tangled of lierne vaults, and vast windows of traceried panels filled in the ends of choir and transepts. It was a daring conception, revolutionary in character, and as audaciously carried out. (Fig. 229.)

Step by step as the windows had widened since the mid-XIIIth century, so had the glass painter followed hard behind the mason, greedily seizing on and jewelling the traceried panels with all the glory and radiance of scintillating colour attainable by stained glass alone.

The English mason could resist the temptation to suppress the wall for lean constructional purposes; his ideal, as we have seen, lay elsewhere, but what he would not do merely to exhibit structural dexterity he did for the sake of admitting the full palpitating chord of colour in the painted window.

At Carlisle east front or Ely Lady chapel one might deem it time to call a halt; but Gloucester went further and outstripped them in the increase of its window area, while York presbytery was later to follow suit.

The simplicity of the Gloucester constructive ideal found favour everywhere, and the fashion quickly spread in cathedral, chapel, collegiate, and even humble parish church, of inserting vast end windows and tall ranges of clear-story lights, these latter usually doubled in each bay and set so closely that the wall is all but absent. With the weakening of the wall came hand in hand the strengthening of the buttresses and the piling up of pinnacles to weight the attenuated structure. But this was not consummated in its entirety as yet. The work at Gloucester began with the reconstruction of the south transept, 1331—1337, followed by that of the choir, *c.* 1337—1350.

Back came the emphasis of the vertical in line and proportion, which not all the reiteration of horizontal cornicing and squaring of panelling could curb. The resultant rectangularity was quite a departure from the low, open breadth of Exeter, Wells, or Ely. The panelled surfacing, too, and liny verticality—dimly foreshadowed at Bristol—appeared at Wells and Ottery St. Mary (Plate, page 321), and was now to endure.

From the Western school had largely come the impulse of our first Early Gothic, succeeded by the dominion of the Southern school during the XIIIth century; and now again in mid-XIVth century the influence of the west became thus paramount once more, when the Black Death prepared the way for its expansion far beyond the confines contemplated by its local use.

Such was the Rectilinear art of Gloucester which swept off, as it were, at a tangent from the circling and sinuous branching of the contemporary Decorated work. In violent contrast, too, was the architectural angularity which proscribed the riotous floral exuberance of Ely, abhorred the undulating naturalism of its technique in foliage, and flattened out its bossiness, straightened its curves, and squared its contours. It reverted to an arbitrary conventionalization, banned the foliaged cap, scattering pateras in the hollows of its cornices and arch moulds, parading up and down the mimicries of constructive detail in miniature. Buttress and pinnacle, panel and battlement, sweep over the structure in an invading host, and perch themselves on every coign of vantage.

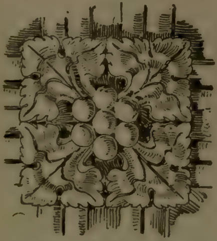


FIG. 230.—Wood Boss, St. Mary's, Bury St. Edmunds.

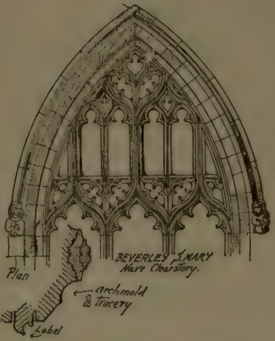


FIG. 231.—Straightening of Tracery.

The shaftings shrink and become little more than overgrown roll mouldings, the sweep of the rounded abacus and base give place to the jutting octagon. Panelled surface and cusped arch are rampant everywhere. The three-quarter hollow is flattened out into the wide and shallow "*casement*" of Rectilinear use. (Compare Figs. 219, 249 and 372.)

We see this art, so rich and ostentatious, liny and lean in place of fecund roundness and prodigal voluptuousness thus introduced as a casing, or veneer, on the earlier work. This in itself was a system quite opposed to that of the earlier Gothic, which shaped its construction into beautiful form by decorative emphasis. (Figs. 175 and 228.)

Although one may deplore the avowed artificiality of its first ideal and introduction, yet in this, its peculiar practical adaptation to economic conditions, we see again the tendency of the English mason towards simplicity and straightforwardness, even at the sacrifice of things and æsthetic principles which were otherwise eminently desirable in themselves.

And in the suppression of carving and sculpture, and in its independence of the allied crafts, we see how self-reliant and complete the new art was. It was pre-eminently architectural in conception, limitation and quality, and was perfectly adapted to the changing status of the mason, who now found himself as an independent craftsman, no longer bound by the dictates and whims of cleric or noble. Thanks to mutual combination in guild membership, sought after as his services were, he began to undertake work at first corporately, under guilds, and then contracted independently. All these changes made for the imperceptible introduction of a commercial factor, for now it ensued that the mason looked to make an honest profit from his labour, and the new art in its suppression of superfluities and in its reliance on its own handicraft complied with the new commercial conditions. After the feverish energy of the works from 1300 to 1350, and the enormous output, there comes a lull, while the affairs of the State were being reorganised subsequent to the Black Death.

Buildings.—Meanwhile, Gloucester went on steadily with the north transept, and Westminster Abbey resumed the work of rebuilding the early nave but slowly and intermittently. Here, as noted before, as at Beverley and Exeter, one may study how the later

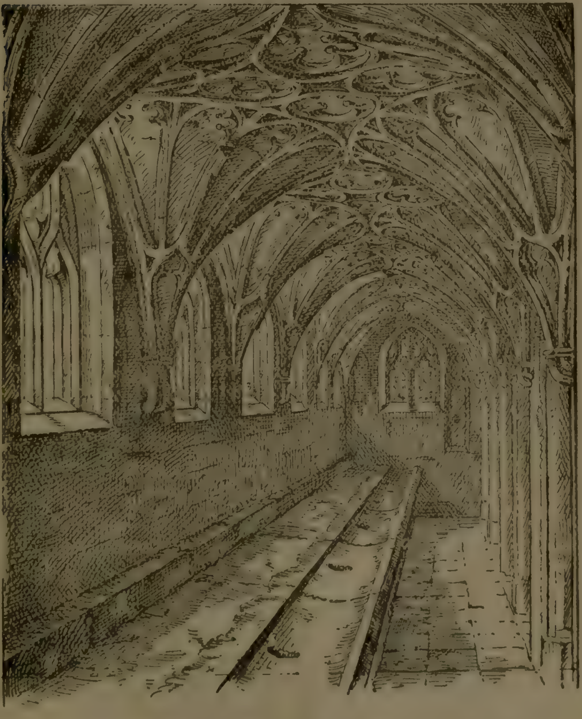


FIG. 232.—Fan Vault. The Lavatory, Gloucester Cathedral.

work was largely conditioned by and kept in harmony with, the earlier work. The general ordinance is that of the incomplete structure of Henry III, but as the work crept on so does the detail become modified in mouldings and the like. For instance, the piers of the choir were of the orthodox southern type with detached marble shaftings; in the later nave these shafts are built up in courses with the pier itself, and the mouldings, bases, etc., correspond with the tracing of the contemporary profiles common at the time.

The next (and a most important) achievement of ever-progressive Gloucester was that of the fan vault, introduced in the rebuilding of the eastern walk of the cloisters, 1351—1377, which were completed early in the XVth century. (See Chapter on Vaulting.)

At Norwich, in the reconstruction of the choir clear-story, the Gloucester method of remodelling and casing is seen. Spreading by way of Edington Church (*c.* 1352–61), the new detail appears in Winchester west front (*c.* 1360), and by 1361 it arrives in the north, when the presbytery of York Cathedral was built under the influence of the same school, though with a subdued under-current reminiscent of Decorated tradition running through it. This is succeeded by the building of the choir (*c.* 1380—1400), and contemporary with this Beverley Minster was erecting its west front and towers (*c.* 1380—1430).

In the south, Winchester having completed its choir, remodelled its Romanesque nave, 1371—1460 (obliterating the earlier triforium), and canopied with the tangled interweaving of its lierne vault; so that by the end of the century in cathedral, abbey and church, the Gloucester craft had established everywhere the

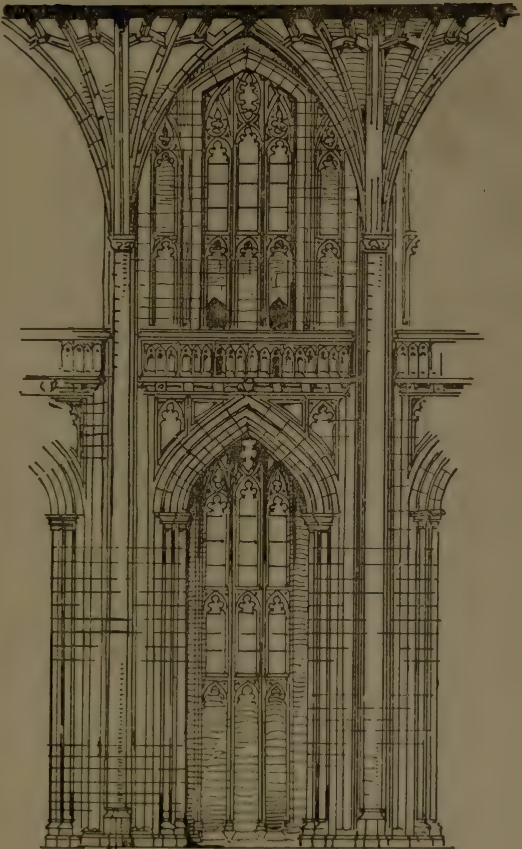


FIG. 233.—Winchester Nave.
Remodelled Romanesque Structure.

unquestioned over-lordship of its sway, when Canterbury in 1379—*c.* 1400, under Prior Chillenden, rebuilt its nave in Perpendicular, following the example of Winchester, particularly parochial in its ordinance, with low clear-story and lofty pier arcade.

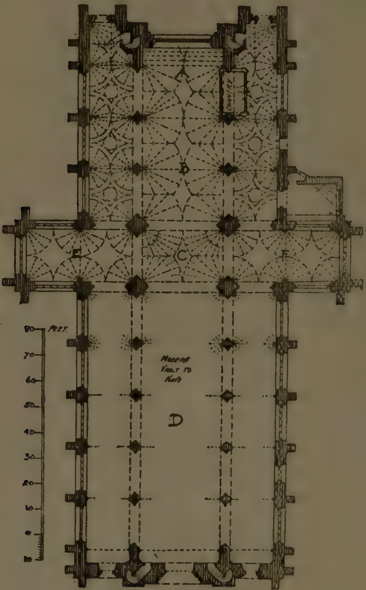


FIG. 234.—Bath Abbey.

The remaining examples of the greater building not previously noted are not many, and these are smaller in scale than those hitherto considered.

Sherborne Abbey, during the XVth century, vested itself in Perpendicular, and luxuriated in a fan-vaulted nave and choir, and contemporarily with this work Christchurch Priory rebuilt its eastern end, the choir vault, however, not being completed till early in the XVIth century.

The Augustinians set out the building of the great church which was the mighty shrine of our Lady at Walsingham, now, alas! ruined and desecrate. A faint glimmer of its departed glories still hovers around the dainty XVth-century pilgrims' chapel (the Shoe House) at Houghton-le-Dale, Norfolk, whence the pilgrims walked barefoot to the great church. (Fig. 209.)

With these and the work at the abbeys of Malvern and Bath, the story of the greater building draws to a close.

Collegiate Building.—In place of monastic building we find an increasing number of colleges founded.

Walter de Merton, Bishop of Rochester and Chancellor to Henry III, had earlier given an impulse to this when he founded Merton College, Oxford, the object of which was to assist poor scholars who were not clerics, and furthermore, no cleric was to be a member of this body: a significant development in the separation of learning from clerical control.

This was followed by the foundations of Wykeham, Chicheley, and many others at Winchester, Oxford, Cambridge, and elsewhere. Later on, in the XVIth century, Cardinal Wolsey created a dangerous precedent, when he suppressed certain monasteries to found Cardinal (now Christchurch) College, Oxford. We see then how in the late Mediæval Period it was felt that a remodelling of educational facilities was called for.

Vaulting.—The most brilliant achievements of this phase of our Mediæval Architecture are chiefly connected with the last *tours de force* of the English mason in vault design, both lierne and fan, at Sherborne, Oxford Divinity School and Cathedral choir, Peterborough retrochoir, St. George's Chapel, Windsor, King's College Chapel, and Henry VIIth's Chapel, Westminster; a characteristic mark of which is the employment of elongated voussoirs wrought into the form of pendants hanging below the surface of the vault. (See Chapter on Vaulting.)

An interesting example of eclecticism indicative of the rising tide of the Renaissance, is the small and graceful vault of quite unusual character in Bishop West's chantry at Ely, and which shows a striking difference to the normal fan-vaulted chantry he built attached to Putney Church.

Perpendicular Style.—Of the characteristics of the work there are several points worth noting.

First, the change instituted at Gloucester fixed the type of work for nearly 200 years, and though in details local practice can be noted in variation, yet the work on the whole is of a standard uniformity.

The mason-craft of the period is generally excellent, and the parsimonious use of stone is notable in districts where there were no local quarries available, as in East Anglia, where the stone is economically eked out. In striking contrast is the boldly-masoned craft of Somersetshire and the like, where the sturdy towers and churches rise defiantly confident, rejoicing in their massy structure of unstinted stonework.

If the masonry is worth study, and the skill which could work the vaults of Oxford and Henry VIIth's Chapel astounds us by its versatility in vault design, which is so strong a mark of the period, the advance in carpentry and wood construction in this the last phase of Gothic is even more characteristic and remarkable.

Not only in the marvellous examples of roofs which abound, with massy angel-decked principal, curved brace and outspringing hammer-beam, as at Trunch, March or Mildenhall, but in the shattered and defaced screenworks and fragments of church furniture, which, although fairly numerous, are only a vestige of the fittings quaintly wrought by the ancient craftsman.

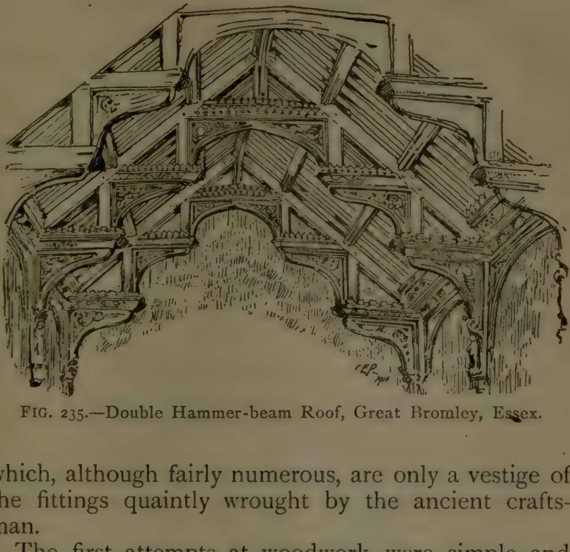


FIG. 235.—Double Hammer-beam Roof, Great Bromley, Essex.

The first attempts at woodwork were simple and unpretending and jejune, apeing the tectonic forms of the masons' stock-in-trade.

But woodcraft was a bonny child, and once set free from the nursing arms of masonic precedent, quickly learnt to run by herself and gambolled in her newfound liberty.

In certain districts, such as the eastern counties, one finds a certain clinging to stone forms, but in the

West a far more free and woody treatment, and closer relation between technique and material, is noticeable. Witness the Devonshire and Cornwall screens, which would perhaps seem to be a survival of the earlier and local tradition of possibly Saxon origin.

It is far more mellow than the dainty paraphrases of stone traceries which grace the half-forgotten wayside shrines of East Anglia.

The development of the wood roof is treated of in a separate chapter.

The art of the time, then, was progressive enough, and achieved its definite aims. Not a little interest lies in the welding together of the types of abbey or monastic building on the one hand, and of parish church on the other; and how the ideals of the two classes of structure, set out at first so widely pointing apart, gradually converged and united. The former cast aside many of the trappings with which it was encumbered, and simplified itself and its arrangements, reacted on by the humble parish church of Anglo-Keltic type, which, conversely, continually enlarged its ideals and increased its spaciousness, borrowing of monastic ordinance, yet always preserving its individuality, till, as at Boston or Hull, Patrington or Coventry, there was little to distinguish it from the Cathedral, except the central steeple in one and the western tower of the other.

So, too, the private chapel which had, in the Xth and XIth centuries, been attached to the dwelling of the thane, the lordly castle, and the episcopal palace, swelled its bulk and augmented its magnificence, as in the St. John's Chapel, Tower of London, Lambeth Palace and Ely Place, till it grows to the fulness and magnificence in the XIVth, XVth and XVIth centuries examples of such as King's College, Cambridge, and St. George's, Windsor.

Parish Churches.—The parish churches form the most considerable body of building of the period, for they ranked first in the affection of the people of the time.

First the abbey, then the secular cathedral and collegiate church, and now came the turn of the parish church.

At the head of the list of the churches of the period, yet withal, quite in a category apart, is the great Church of St. Mary Redcliffe, Bristol, which, with its completely vaulted structure and spacious proportions, is rather more akin to the greater churches.

Far more typical are the great churches of St. Mary's, Bury St. Edmunds, Lavenham, Blythburgh, Southwold, Louth, Cullompton.

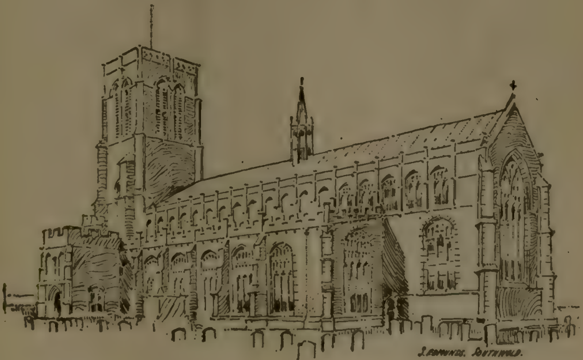


FIG. 236.—Southwold.

Generally in churches of any pretensions the nave and chancel are fully aisled — in some cases the sanctuary projects one bay eastward of the side aisles, thus permitting the high altar to be well lighted.

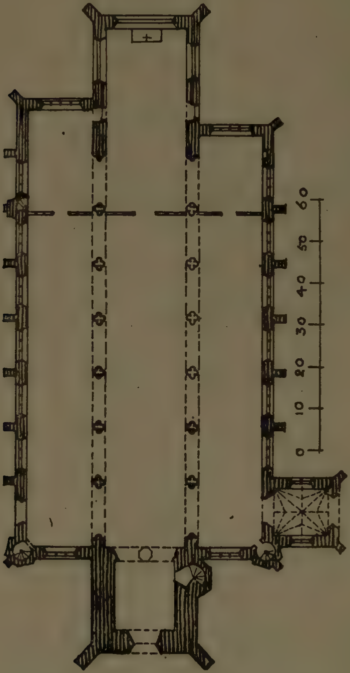


FIG. 237.—XVth-century Parish Church Plan, Southwold.

Another type of church is where there is no structural division of chancel arch or lower roof to choir and sanctuary, as at Southwold, but the roof runs right through from west to east, with only a

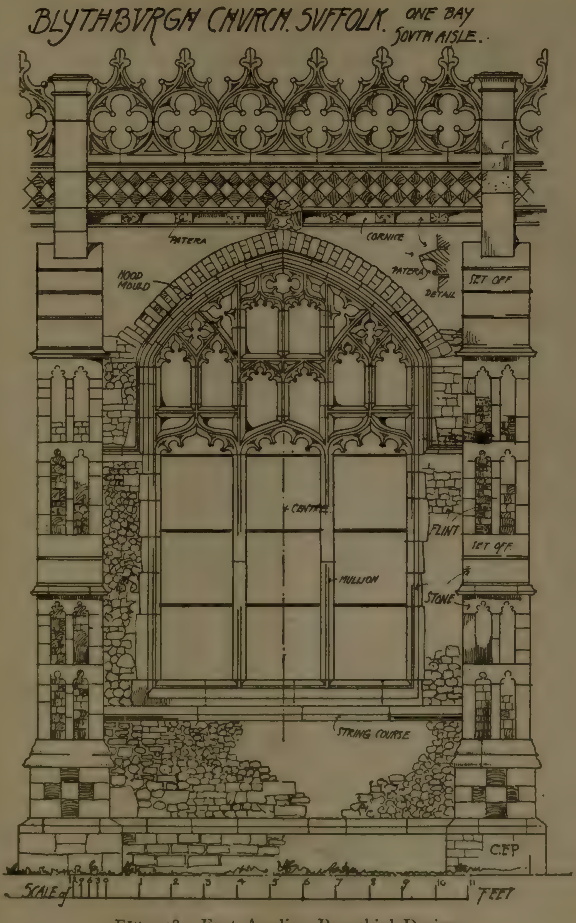


FIG. 238.—East Anglian Parochial Design.

screen to mark the ritual division of nave and chancel. (Fig. 237.)

This is a favourite type in East Anglia, first appearing at St. Nicholas, Lynn (*c.* 1419), and this arrangement was imposed on the builders by the authorities of the parish church of St. Margaret's, to which it was attached as a chapel-of-ease. These were over-anxious to impress its inferior rank on the dependent church, and so it was planned as a *chapel.*

But later the builders seized on the simplicity of this building structure, and examples such as St. Peter Mancroft; St. Stephen's, Norwich; and Long Melford; show that it was fully recognized as a standard type of parish church plan, and the obloquy attached to its first adoption passed into oblivion.

The churches of the period are amply lighted, and the close-ranged windows in clear-story and aisle wall of the Gloucester type, are everywhere. (Fig. 236.)

If there is no western tower, a wide window floods the nave with light, likewise in the east wall, and the end walls of aisles; and, at this time in many an earlier church, were wide windows inserted and tall clear-stories raised on the pier arcades of the nave.

Interiors such as these, now devastated and devoid of the richness of their furniture, whose windows are bleak and bare, without the painted pageantry and mysticism of their coloured glass, appear overlighted; but this was not so in the brightness of their rising.

We see in the restless searching after simplicity the aim of the English ideal, however complex and contradictory may seem their indulgence in highly-enriched roofs, panelled surfacing, and vaulting.

In plan of parish church, cathedral ending, and structural ideal, it always made for directness of expression and simplicity.

Towers.—Of all the adornments and decorative adjuncts most striking, because so prominent, are the towers of the period. There are many varieties and local types of which we may only note a few examples.

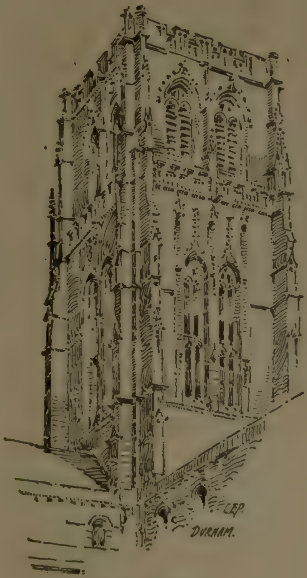


FIG. 239.
Durham Central Tower.

This development of the lofty western tower was the special mark of parish church design inherited from the Anglo-Saxon stock, who had received it from Teutonic sources. (See page 45.)

The XIIIth- and XIVth-centuries towers had customarily been terminated by the lofty slender spire, as at Newark and Patrington, and examples of cathedral rank are Salisbury, Lichfield, and Norwich. After the end of the XIVth century the unspired tower, bulking large and huge, comes into favour, as at Wrexham, Glastonbury, Taunton, and Lavenham.

Most significant was the growth of the central tower of the cathedral, soaring high above the crossing. The following examples of this class of structure form a striking series, markedly of XVth-century fashioning, in seeming emulation of the bulk of the democratic parish church tower.

Wells led off in the XIVth century, but the raising of the tower necessitated the insertion of the scissor-like straining arches which cumber the crossing; this was followed by York, *c.* 1400–23. Then Bristol, *c.* 1450–70, and the magnificent pile of Gloucester, 1450–60 were completed.

Next Durham, about 1470 reared its proud head, and the series culminates in the gracious serenity of the "Angel Steeple" of Canterbury.

Altogether a group of which we have cause to be proud, not to mention the western towers of Beverley, York, and many others.

Re-echoing these, in many a lesser monastic building the addition of towers was carried out. It even infected the Cistercians, who admitted the bell tower at last, as at Fountains.

Porches.—The porches are not the least striking features of the Perpendicular period. Not only in the greater buildings, where the entrance (though never on the scale of Continental use) had always been notable, yet now became more stately and imposing—Peterborough, Canterbury, Hereford.

But in full many a parish church do we find the most significant examples, almost surpassing those

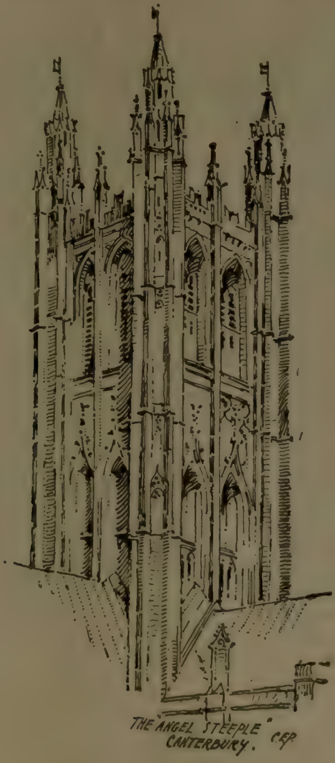

THE "ANGEL STEEPLE" CANTERBURY.
C.E.P.

FIG. 240.—Canterbury.

of the cathedrals in sumptuousness, as at Cirencester, Lavenham, Woolpit, Tiverton, Launceston, Ardleigh, Burford. (Figs. 227, 241.)

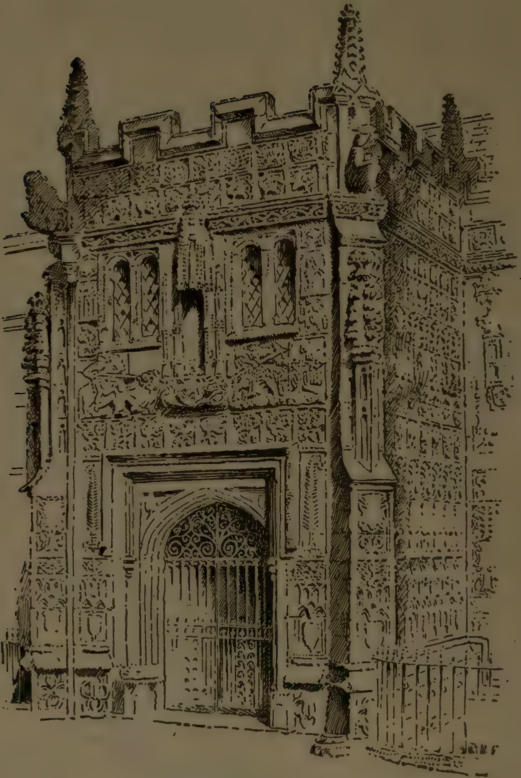


FIG. 241.—Parish Church Porch, Launceston.

Chapels.—Gloucester achieved another triumph in the building of its etherealised Lady chapel, east of the great choir, of which it is an echo; but the wall has

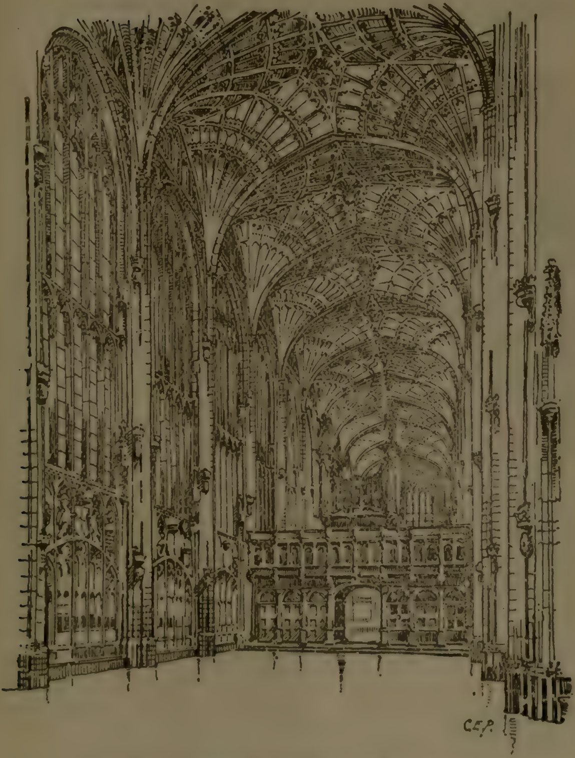


FIG. 242.—Interior, King's College, Cambridge.

given place to window, and surpasses Ely in tenuity of structure and wall elimination, and at Peterborough, Winchester and Canterbury, other chapels were added. But the great examples are detached, such as those of King's College, Cambridge, and St. George's, Windsor. The former is planned as a vast and lofty hall (Figs. 242, 297), with quasi-aisles continued in the recesses between the spreading buttress piers supporting the high far vault. (Fig. 243.)

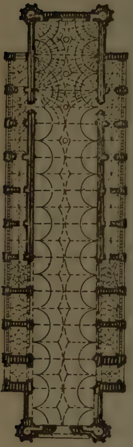


FIG. 243.

King's College Chapel, Cambridge.

In many a parish church, extension had come not alone by added aisle, but by accretion, of *chantry chapels.* The foundation of a *chantry* included, besides the erection of the material structure (in which was the tomb of the deceased and an altar for the celebration of masses for his soul), provision of an endowment for the upkeep of the same. Part of the sum was devoted to the maintenance of the fabric and the payment of the services of the chantry priest, who, in addition to the celebration of a certain number of obits, usually also had some definite duties which devolved on him in the work of the Church, conventual or parochial as it might be. In small village churches he assisted the vicar or rector, and it was the chantry priest who was usually in charge of the free schools, as at Lavenham, of which there were so many in pre-Reformation England; thus the life of the chantry priest was a busy one.

The balance (often the major portion) of the endowment was either allocated to some special object, as in the will of John Smith of Bury, or more usually was left in trust for distribution to the poor, as at Alton, Hampshire. So that, in the suppression of the chantries, it was the avarice of the Crown that robbed the poor.

The guild chapels likewise were endowed and founded for assisting parochial needs in similar manner.

Chantry chapels vary in size and magnificence, from the screened-off end of a village aisle to the stately enclosures of Abbot Ramryge, at St. Albans; Wykeham, at Winchester; Bubwith, at Wells; and Allcock and West, at Ely, or yet more structurally elaborate as the Beauchamp Chapel, Warwick.

But most magnificent of all is that triumphant example of British mason-craft, the Chapel of Henry VII, at Westminster, where at the same time is perfected the long line of Lady chapels, the splendour of which had been the loving care and pride of full many an abbey and cathedral. (Figs. 95, 180.)

We find it planned on more ambitious lines than the usual unaisled structure. Here are chapelled apse and side aisles, raised up and approached by a flight of stairs leading from out of the ambulatory, eastwards of the high altar of the abbey. Set in the midst towards the eastern end is the chantry proper, surrounded with its bronze grille, enclosing the tomb of the royal founder.

The constructive vigour of the design, the thin shelled vault so deftly schemed, the light supporting piers and exposed flying buttress, all demonstrate that right up to the end, the English masons' handicraft, ingenuity, and cunning was as unimpaired and versatile as ever, and, had opportunity offered, prepared for yet more daring triumphs.

And all this only a bare quarter of a century before his successor was to pull down the whole ecclesiastical organization and fabric of the Mediæval Church in England!

Towards its close, during the "Tudor" period, in many examples, the mannerisms of the style become more accentuated, or as some would have it, more "debased," with an increasing use of depressed arches and flat window heads; thus ousting the tracery from the head of the light, sometimes even the cusps are omitted. Slender octagonal pinnacles and turrets are employed with ogee-shaped finials (Winchester, Hampton Court, Henry VIIth's Chapel). Brick had now come into general use, not only in domestic building, such as Hampton Court, but in examples like the south aisle and porch at Feering, Essex.

From Italy come the first direct influences of the Renaissance, independent specimens of which may be seen in tombs and interior fittings (as at Westminster and King's College, Cambridge), or as pure decorative ornament grafted on to the Gothic structure; witness the Salisbury and Draper chantries at Christchurch, Hampshire, or that of Gardiner, at Winchester. Still again less structural are the inset panels at Hampton Court Palace.

The influence of this Italian school was brief, and examples of its art are chiefly confined to the south-eastern portion of England. The break with Rome and the policies of Edward VIth and Elizabeth diverted the course of the main stream of the Renaissance, which then overflowed into England by way of Germany and the Low Countries.

The greed of Henry VIII, which led to his assumption of prerogatives hitherto papal, the spoliation of churches, and the suppression of monasteries, affected art throughout the land to a greater degree than is generally understood; and architectural effort, as far as ecclesiastical life, was practically dead.

Analytical Summary of the Perpendicular or Rectilinear Period.

CHARACTERISTICS :—

Work Democratic and Parochial.—In the hands of lay craftsman.—Specially native and insular.—Diverging from Continental practice.—Detail standardised.—Simplification of structural disposition.

External political and social factors cause a shifting of interest and energy away from the greater building to those of relatively less important rank.

The Black Death cuts short the Decorated building tradition, making way for the spread of the Gloucester craft school.

ORDINANCE :—

Proportions.

Insistent reiteration of rectangularity, both horizontal and vertical.

Planning.

Chief developments in parish church and great chapel design ; planned as vast halls. (Figs. 237, 243, 400, 416.)

Lesser chapel design of the guild and chantry class becomes ambitious in parish churches, complicating, obscuring, and modifying the setting out of the earlier fabric to which they are attached, *e.g.*, Burford.

Bay Design.

Preference shown for a one-storied scheme, with vaulting shafts or vault piers demarcating the bays, and rising in unbroken height from floor to vault; clear-story (triforium, if any), pier arcade treated as subordinate divisions. (Figs. 225, 233.)

Clear-stories.

Increase in area; both wider and taller than previously customary.

Triforium.

Unimportant; often only a gallery or passage-way running along beneath cills of clear-story windows, the jambs of which descend to level of string above pier arcade. Triforium arcade therefore suppressed, and with the lowering of the pitch of the aisle roofs the triforium chamber is reduced in height, and may be marked by a blank wall space or a range of panelling or niches.

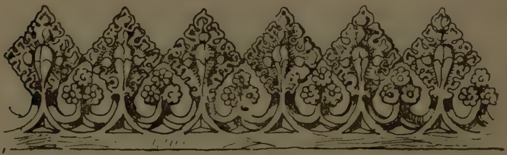


FIG. 244.—The Tudor Flower.

Pier Arcade.

Of lofty proportion, especially in greater parochial work.

West front.

Twin-towered façade seemingly goes out of favour. Beverley Minster is the one important example. Canterbury built her south-western tower; the original Romanesque north-western tower remained till *c.* 1834, when it was "restored" (? *sic*).

The influence of the parish church on the greater buildings is nowhere seen more strongly manifested than in the marked parochial ordinance of many important towerless west fronts. At Winchester and Gloucester this type ousted even the twin-towered front. Bath and St. George's, Windsor; Norwich; are other examples.

The dominant feature of the design is the great west window, flanked by those terminating the aisle alleys.

The structural division of nave and aisle is emphasized by buttresses crowned with pinnacles, or, as at Bath, octagonal turrets shoulder the nave.

Similar to these, but on a smaller scale, are the west fronts of the greater parish churches, *e.g.*, Beverley, St. Mary's; St. James, Bury St. Edmunds (Fig. 53); Hull.

Where there is a western tower it is usually axial to the nave—Lavenham, Brightlingsea, Wrexham—in which case the west window is much less prominent; or more rarely as Terrington, St. Clement's, the tower stands at one end of the façade; or, again, less commonly, it may form the west end of one of the aisles.

East fronts and Transept façades.

Similar in treatment to the untowered west fronts, with wide and lofty windows and strongly-buttressed angles. Flattening of gables consequent on the lowering of roof pitches.

Towers.

These are built on a big scale —Lavenham—and are important structures. Usually, the spire is discarded, and the place is taken by a coronet of angle-turrets or pinnacles, and elaborately pierced battlements, *e. g.*, Glastonbury, Taunton; St. Michael's, Coventry, and Louth, however, show vigour of spire design still unimpaired, and Newcastle cathedral, formerly St. Nicholas, possesses a masterpiece of scientific construction—a central pinnacle poised aloft high above the tower, supported by four light flying buttresses rising with their pinnacles from the four angles of the tower. After about 1350 an intermediate octagon or lantern stage is interposed between the top of the tower and the base of the spire, and this is retained sometimes when the spire is discarded as a crowning feature.

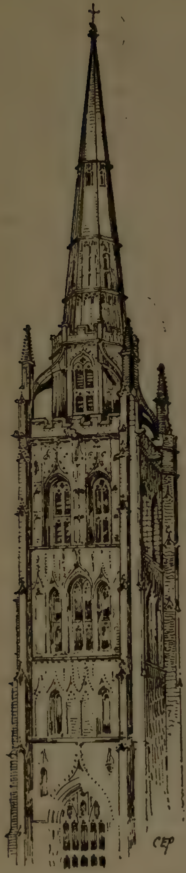


FIG. 245.—St. Michael's, Coventry.
Spire with Angle Pinnacles, Flying Buttress, and Octagonal Stage.

CONSTRUCTION :—

In certain cases, in place of rebuilding, a remodelling and recasing of an earlier fabric.

Development of pier construction and skeleton stone framing. (Figs. 229, 247, 301, 307.)

Wall.

Owing to increase of window area, wall surface is greatly reduced, very often only a slender pier is left between apertures. (Fig. 225.)

Both internally and externally wall is richly treated with panelling and ornament. (Figs. 224, 227, 233.)

Arch.

During the late XIVth century, obtusely pointed (2-centred) gradually becoming flatter in curve and 4-centred. (Fig. 2 (12).)

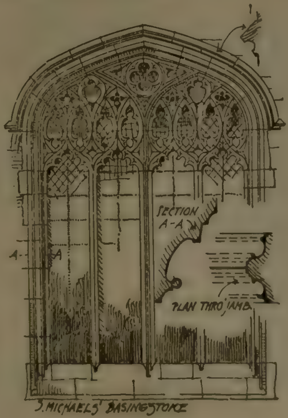


FIG. 246.—Basingstoke.
Lowering of Window Arch.

This raising of the "haunches" and lowering of the "crown" results in the almost entire disappearance of the "spandrel" piece by the consequent encroachment on the wall space by the aperture of arch, door, or window,—Blythburgh, Basingstoke (Figs. 238, 246).

Insertion of light traceried "strainer" arches to strengthen piers beneath or adjacent to towers, etc.—Salisbury, Canterbury; or across a nave, Rushden.

Vault.

Marked by great versatility in design, intricate elaboration, and ingenuity in construction. Types—lierne and fan: clever combinations of barrel and intersecting vaults, *e.g.*, Oxford Cathedral; St. George's, Windsor. Employment of strong "transverse arches," with elongated voussoirs in the form of "pendants," gives rise to new combinations in lierne and fan vaults.

Web.

Rib structure set so closely that the infilling of vault-cells is reduced to a panel or slab, then the vault becomes all web, a thin shell of masonry with the ribs carved on the surface. (See Chapter on Vaulting.)

Abutment.

Flying buttress become more acutely pointed (Sherborne, Bath Abbey), light in structure, with pierced tracery spandrels. For additional rigidity, reversed curve introduced in Henry VIIth's Chapel.

Wall and angle buttresses have increased projection, projecting in many stages highly enriched with niches and moulded set-offs crowned with ornate pinnacles, *e.g.*, Brightlingsea, Wrexham.

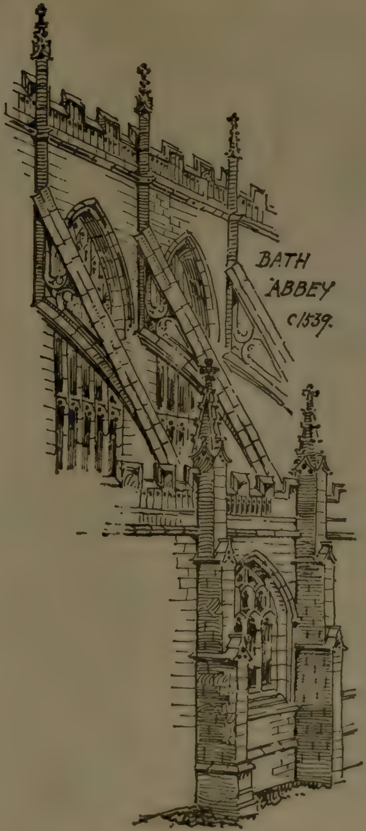

BATH ABBEY c1539.

FIG. 247.—Perpendicular Abutment.

Pinnacles.

Constructionally developed to weight the attenuated wall-structure and points of support.

Piers.

Of (1) elongated lozenge plan form, mullion-like in aspect.

(2) Oblong cruciform plan. (1) and (2) have usually two or more small engaged shafts. These alone have capitals, the rest of the arch mouldings and those of the pier are continuous.

(3) Ribbed pier. Usually unsymmetrical and irregular in outline, determined by the disposition and profile of the mouldings of the members of the structure ranged around or supported by the pier mass.

Shafts.

Generally few, small and unimportant, as are also the capitals to same.

Capitals.

Polygonal instead of circular in plan, concave in outline, upper surface of abacus chamfered, sometimes battlemented and crested. Bell indistinct. Mouldings large and few. Astragal —debased keel and scroll moulds or rounded. (Figs. 249, C, H; 385, 386.)

Bases.

Lofty. Polygonal in plan, with bell-shaped mouldings and chamfered "ledgements" or set-offs arranged in tiers. (Figs. 186, 387.)

Roofs.

Scientific in design, oft complex in structure, richly wrought with decorative treatment.

Types.—Tie Beam, Arch-braced, Hammer-beam. (Figs. 353, 362, 365.)

Vertical wall-pieces introduced; first, to give the trusses a good bearing on the wall, and then owing to weakening of the latter through window widening, these wall-pieces are supported on corbels in order to bring the load of roof-structure lower down on to the walls.

Gradual flattening of pitch in England, while in French work the tendency is to increase the slope. (See Chapter on Roofs.)

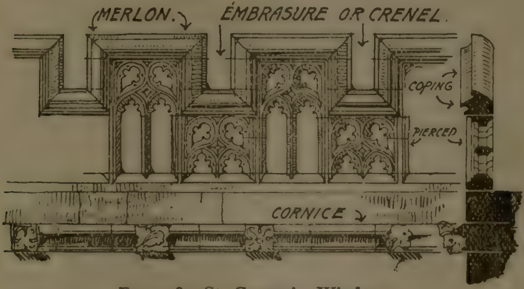


FIG. 248.—St. George's, Windsor. Battlemented Parapet.

Parapets.

Owing to this disappearance of the roof externally the parapet becomes important, richly treated, panelled, pinnacled, and *battlemented.*

During the XIVth century the latter supersedes the horizontal level coping. (Compare Figs. 216, 227, 248.)

Openings.

Windows closely ranged, doors important.

Doors.

In later work usually framed with a rectangular hood mould; spandrels traceried or filled

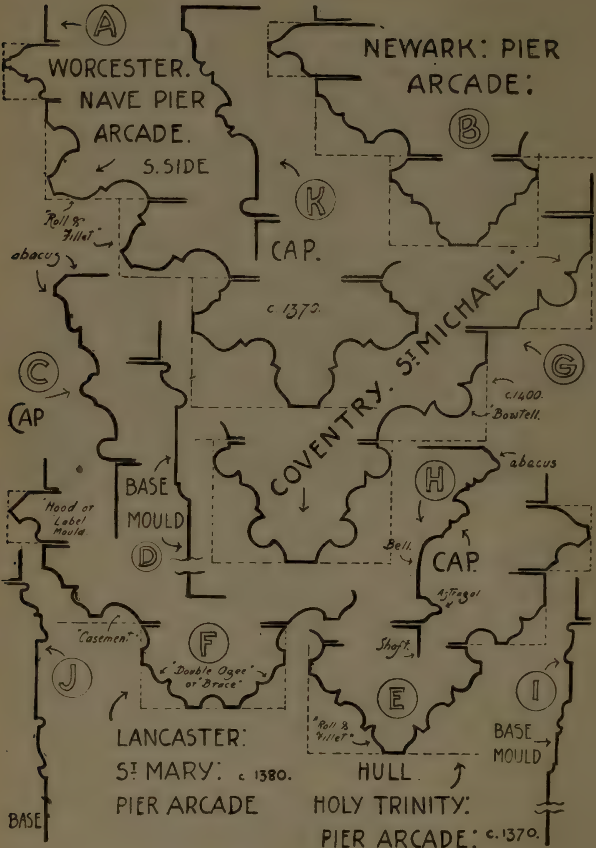


FIG. 249.—Perpendicular Mouldings.

with carving. (Fotheringhay.) Few shafts, moulding of arch and jamb mostly continuous.

Windows.

With pointed, segmental, four-centred, or square heads.

Subordination of tracery further simplified. Tracery, normally rectilinear or of gridiron-like character, with vertical mullions carried straight up into soffit of window arch, stiffened by horizontal bars or "*transoms.*" Head of window becomes flatter and subdivided by "*supermullions*"; consequent multiplication of lights and extension of window area facilitated by this new method of construction, *e.g.*, York, 9 lights; Gloucester, 14 lights; St. George's, Windsor, 15 lights.

Chamfer cusps broadly pointed. Heads of lights cinquefoiled.

DECORATIONS :—

Mouldings.

Generally lie closely to chamfer plane; distinction of arch orders lost. (Fig. 249.)

Small bowtells, about three-quarters of a circle in section; double ogees or brackets.

"Casement" hollows are at first narrow, later become wide and shallow. Ogees are of S-like section.

Ornament.

Whereas earlier ornament partakes of a sculpturesque and free character, it now becomes severely architectural and conventionally abstract.

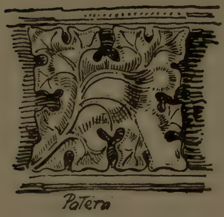


FIG. 250.—Patera, Westminster.

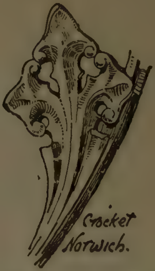


FIG. 251.—Crocket.

Perpendicular Foliage.

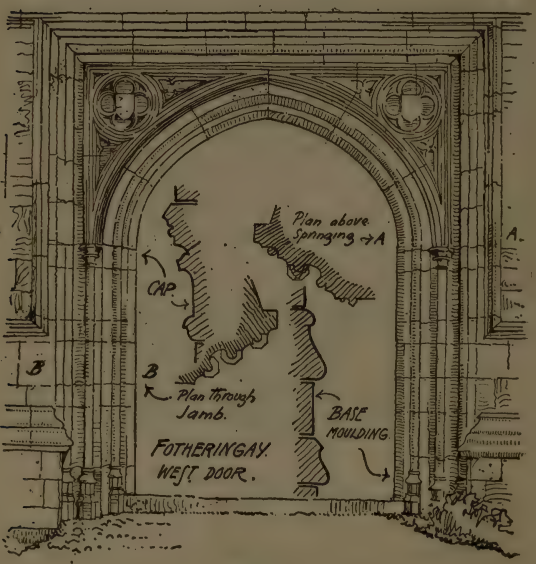


FIG. 252.—Perpendicular Door.

Carving square and angular in outline and flattish in surfacing, applied in spots and at intervals.

Large and reiterated use of conventional symbols as ornament, such as shields charged with heraldic devices, monograms, emblems, etc.

The rose, vine, and pomegranate—principal floral *motifs*, especially the rose, owing to its being the badge of the Houses of York, Lancaster and Tudor.

In the West of England, continuous running patterns of band-carving in cornices, caps, screens, etc., are much more common than in the east, and are much freer in treatment.

Devonshire capitals are treated with twisted wreath of flowers.

In sculpture great attention is paid to elaboration costume details, but imagery tends less to fidelity of portraiture than to stereotyping of a stock pattern. But in the carving of grotesques, notably in devils and gargoyles, vigour is kept up to the last.

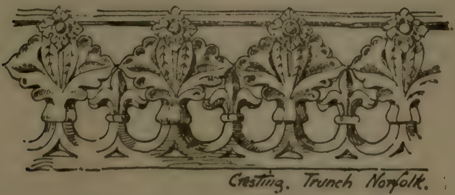

Cresting. Trunch Norfolk.

FIG. 253.—Perpendicular "Brattishing" or Cresting.

Crestings or "*brattishings*" are elaborate, an oft recurrent type is that of the Tudor flower (Fig. 244).

The *foliated panel* is the stock decorative *motif* and unit of design, and is ubiquitous and protean. Pierced, it forms the window light and wood screen, carved on the surface it gives the decorative texture to wall, and later to the vault, and recessed it forms a niche.

Reiteration of constructive features in miniature—battlements, pinnacles, canopies, buttresses, etc.

Photo by H. T. Edwards.

Ottery St. Mary.

CHAPTER XII.

Evolution of Mediæval Construction.

We have surveyed briefly in the preceding chapters the historical development of English Mediæval Architecture more particularly in its æsthetic aspect, as presented to us by the buildings of the successive periods. We now turn to inquire how this came about from the standpoint of constructive requirements and methods of building.

As before noted, the principle of mediæval construction was the spanning of spaces by arches carrying loads, and the concentration by this means of such loads on definite points of support (Fig. 1, page 3). For a comparative plate of arch forms, refer to Fig. 2, page 7; for a description of parts, see pages 4 and 5.

Arches: their form and construction.—Up till nearly the middle of the XIIth century the semicircular arch was supreme and brooked no rival. The segmental, elliptical, horseshoe, and kindred variants of the standard type were only tolerated as constructional expedients to facilitate vaulting.

True it is that the Saxons had often used straight-sided arches, if they may be regarded as such, but these were only employed more from ignorance and lack of skill as to the proper construction of arches with radiating joints.

The introduction of the pointed arch in the place of the semicircular originated in constructive requirements.

First, as we shall see, the latter was very intractable to handle in vault design.

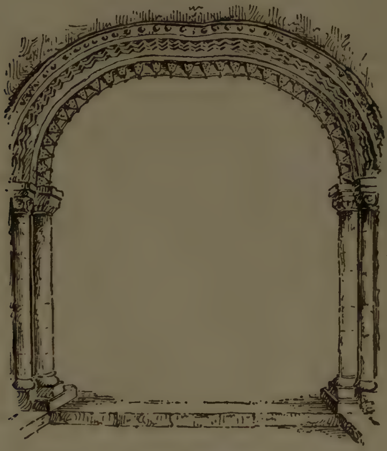


FIG. 254.– Crippled Semicircular Arch.

Secondly, despite the marked æsthetic preference of the builders for it, they realised its weakness and drawbacks, both as to its thrust and as to its tendency to buckle at the haunches, causing the crown to become depressed (Fig. III, page 3), and consequently endangering the stability of the structure.

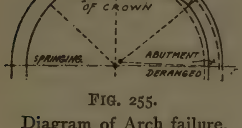


FIG. 255.
Diagram of Arch failure.

Yet, when repeated experiment had demonstrated to them the superiority of the pointed form, they only admitted it on structural sufferance at first, in vault ribs and in parts subject to great strain, retaining for other openings, etc., of minor constructional import, where no risk of failure was to be apprehended, their much-loved and traditional form. So that during the Transitional period from Romanesque to Gothic, from round-arched to pointed construction, we find the two forms in concurrent use, as at Worcester (west bays of nave), Ripon, Glastonbury, and elsewhere.

The pointed arch appears in nave arcades about 1150, as at Fountains, in the North. Buildwas, in the West, had been building thus even earlier, to be quickly followed by Worcester, Llanthony, Wells, etc. But before this it had been employed in the transverse arches of the high vault of Durham nave.

These early arches are very obtuse and but slightly pointed in profile, closely approximating to the earlier form. (Figs. 120, 266.)

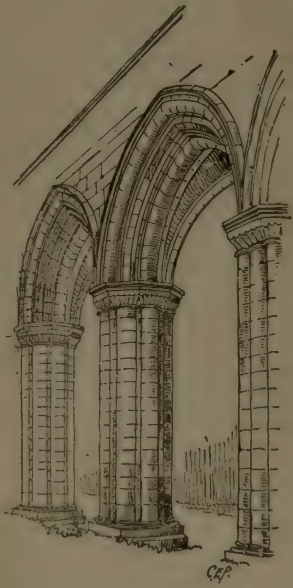


FIG. 256.—Kirkstall Nave.

The pointed arch is practically the two arcs forming the lower portions of the semicircular arch placed together, the intervening segmental upper portion, the crown, which was the source of weakness, having been removed.

With the birth of the fully-developed Gothic art, the general lightening of structure and emphasised verticality, came the more acutely pointing of the arches during the XIIIth century. The arches are struck from centres on the springing line of the arch, but placed beyond the limits of the span, as in Fig. 2 (8), page 7. This is the *Lancet* arch.

Towards the latter part of the XIIIth century the *Equilateral* arch comes into more general use, and is the standard type showing the feeling for breadth and spaciousness so characteristic of the XIVth century. But both the lancet and equilateral arches are employed during the XIIIth century concurrently.

During the XVth century the centres are placed *within* the span of the arch, as in Fig. 2 (9), page 7, and this *Obtuse-Pointed* arch more typically takes the place of the equilateral form.

The employment of the compound curve, or four-centred arch, for vault ribs, concurrently with the flattening of roof pitches, is re-echoed in the forms of the arches, which tend to become lower, wider, and more open: and this lasts till the end of the Mediæval period. But there is an ever-increasing tendency, especially during the early-XVIth century, to employ the depressed *four-centred* arch, which strongly marks and characterises the Tudor period.

Another form had appeared during the Curvilinear period of the XIVth century, that of the *ogee* arch (Fig. 2 (13), page 7), with the central portion of the crown arranged in a reversed curve.

This typical form, originating in the contemporary tracery, was essentially unconstructional if employed for structural arches spanning openings, and is rarely for aught else than tabernacle and minor decorative work of niche-like character.

Ely Lady Chapel is an example of its employment on a large decorative scale.

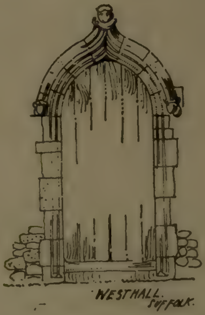


FIG. 257.—Ogee Arch.

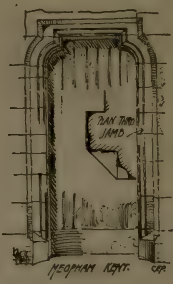


FIG. 258.
"Caernarvon" Arch.

So, too, the earlier *foiled arch* of the XIIIth century limited in use at most to window openings and door-heads of small span, was largely employed to give variety in the composition of the wall arcading so markedly characteristic of the period.

A foiled arch is one whose sides are formed by a series of curves which do not run straight through from springing to apex, but which break forward, forming a pointed projection termed a cusp, and dividing the arch-head thus into three or more divisions called foils (Fig. 2), *e.g.*, Byland, west door (Fig. 129).

If the curves form three such divisions the arch is said to be trefoiled; if five, cinquefoiled. If a foiled arch is placed within an outer one, of say, simple pointed section, this latter is termed a *foliated* arch (Fig. 2), *e.g.*, Merstham (Fig. 167), Warmington (Fig. 168).

A form often occurring in small XIIIth-century doors, variously termed the "*Caernarvon*" arch, shouldered arch, or square-headed trefoil, is shown in Fig. 258; it is, in fact, a corbelled lintel.

"*Stilted*" arches are those whose centres are raised above the springing line, Fig. 2, Nos. (3), (4), (6); *segmental* arches have their centres below the springing. (Fig. 2, Nos. (5), (6), (11).)

The Sub-Arch.—An examination of, say, an early and simple Romanesque door, or a pier arcade with plain arches, reveals the fact that it is built up of a series of concentric arches or "*orders*" set one within the other and receding back from the wall face.

This arrangement was a wise constructional device in its origin, that of the *sub-arch*, another result of the application of the principle of economy in centering, which we shall find practised in vault construction.

Suppose, then, that an arch, with a plain flat soffit, has to be constructed to carry a wall, say, five feet thick; the centering to support it during progress of construction would necessarily extend the whole thickness of the wall. (Fig. 26.)

To reduce this initial expense and to economise, the Romanesque builders constructed, instead of an arch 5 feet broad—a soffit, an *inner arch*, or sub-arch, with its temporary centering, say, only 1 foot or 18 inches in breadth. When this was complete, upon its extrados, using it as a permanent centering, they turned another concentric arch, oversailing or projecting beyond it, repeating this operation as many times as necessary, till the outer arch was as broad as the wall it was designed to support.

Each concentric arch is termed an "*order*," and the entire compound arch so constructed is said to be of two, three, or more *orders* according to the number of recessed arches employed.

Sometimes the arches were constructed with the outer facing of the orders of dressed stone and the inner portion filled in with a core of rubble, especially in districts where good building stone was not to be had locally.

(For the decorative expression and contouring of these arch forms by mouldings and ornament, refer to page 459.)

APPLICATION OF VAULT TO BASILICAN STRUCTURE.

The elementary principles of construction and external factors affecting Mediæval Architecture, together with the early Christian basilica (Figs. 3, 4, 5), and its functional structure, have been dealt with previously. (See pages 8—15, *ante.*)

We now pass on to consider how these principles and factors, the growth of ideas and the introduction of the vault, modified and transformed the wood-roofed basilica into the vaulted cathedral, from a simple to a complex structure.

Space does not permit of an exhaustive catena of examples. We commence, then, with a structure divided into nave and aisles by a range of piers supporting arches, and these in turn sustain the clear-story walls. (Fig. 6.) It was desired to substitute a stone vault for the timber roofs of such a building.

The Barrel Vault.—Now to elaborate. Let us, as in page 14, Fig. II, substitute an arched barrel, or tunnel vault, for the simple lean-to roof of aisles indicated in Fig. I. This vault exercises a *continuous* thrust *along its entire length*, and tends to produce deformation of the structure, as shown in

Fig. III, unless adequately abutted. This can be easily done as regards the external aisle walls at Y, Y, by thickening them sufficiently or building a series of buttresses or spur-like piers of masonry at intervals; but with regard to the nave side at X X, it is a more difficult problem. Here the pressure from the aisle vaults may be counteracted in two ways:—

(I) By throwing another barrel vault across the nave, as shown in Fig. IV, which opposes a counter-thrust to the aisle vaults. The objections attaching to this method are:—

(A) The clear-story windows are blocked up; and the nave, rendered dark, depends on the aisles for light. This was not objected to in the southern portion of France, but was unsuited to northern climates. (See the diagram of Issoire (page 333, Fig. A), for an example of this system.) An arrangement of this kind was employed in the chapel of the Tower of London.

(B) Unless the thrusts of nave and aisle vaults were nicely balanced, the building might be liable to deformation, as shown in diagram form. (Fig. V.)

(II) By retaining the timber roof of the nave, as in Fig. II, page 14, and either by raising or thickening the clear-story walls, so as to weight the piers of the nave arcade in order to annul the thrust of the lower aisle vault, a principle also shown in Fig. VI, page 3, in diagram.

Thus we have obtained a barrel vault to the aisles, but the problem of the high vault to the central nave is yet unsolved. At Fountains transverse barrels were employed to cover in each bay of the aisle. (Figs. 96, 120.)

The Cross or Groined Vault.—Besides the dome and barrel vault, the Romans, in roofing their buildings, also used a vault known as a groined or cross vault.

If we take a cross-shaped building, or two corridors, E F, G H, crossing each other at right angles,

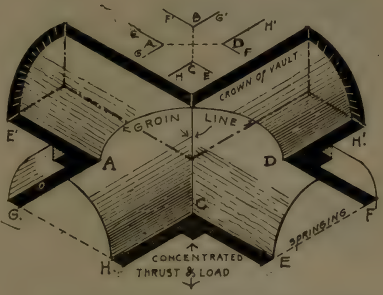


FIG. 259.—Interpenetration of Barrel Vaults generating a Cross Vault.

each covered with a barrel or semicircular vault; at the point of their intersection, A B C D, we obtain such a groined vault. (See Figs. 259, 263, V.) It is clear that the inter-penetrating barrel vaults, E F and G H, exercise thrust continuously against their abutments, G A, H C, and E C, F D, etc.; but where the groined vault is generated at A B C D the thrusts and weights are concentrated on these points of support alone. (See also Figs. 62, 71.)

The Romanesque builders then adopted such a vault, and used it for covering the aisles of their churches. This gave an arrangement of plan shown on page 14, Fig. VI, the directions of thrusts being indicated by arrows. It will be noted that the external wall between points, D D, ceases to be directly engaged in opposing the thrusts and taking up the weights. (Compare also Figs. I and II, page 335.) The thrusts and weights being concentrated instead of distributed became more dangerous, but at the same time—being localised—were more easily dealt with. The sections of massive wall between the points of support, D, D, being no longer required in that position, could be swung outwards as buttresses, D E, immediately behind the points of support in direct line parallel to the thrust, and a thin enclosure wall sufficient for lateral stiffness was built between the piers. (See page 14, Fig. VI; page 335, Fig. II; page 351, Figs. I, II, III.)

This re-arrangement of material of course only took place gradually, but it strongly marks the difference between the Romanesque and Gothic constructive systems. In the former the wall was set at *right angles* or *athwart* the thrust line (page 351, Figs. I^Y and II), serving as support, abutment, and enclosure: in the latter, the wall *qua* wall almost ceases to exist and becomes a buttress, set in line with and parallel to the thrust forces, while a pier takes up the weights. (Page 351, Figs. I^Z and III; page 156, Fig. 115; page 219, Fig. 175.) But this is to anticipate. Let us return to the *groined* vault over the aisles of a church. (Page 14, Fig. VI.)

All that was requisite to ensure the stability of a like structure was to see that the piers, C, C, of the nave arcade were adequately weighted and that the points of abutment, D D, were sufficiently strong. (Fig. 261.)

So far the first stage of the problem of cross-vaulting the aisles is solved: the question of the high vault of the nave again claims our attention.

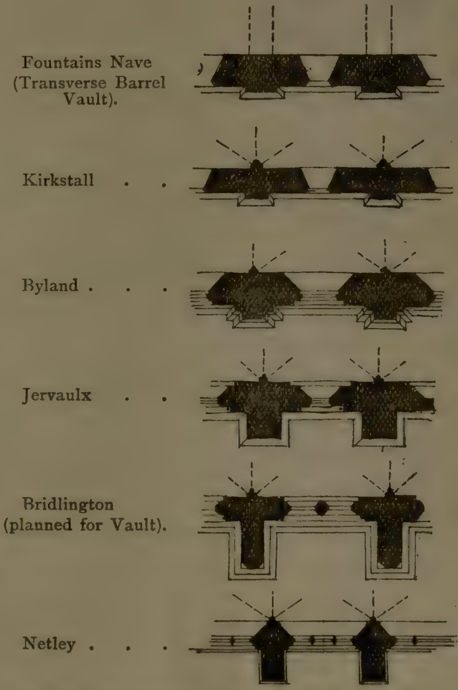

Fountains Nave (Transverse Barrel Vault).
Kirkstall . .
Byland . . .
Jervaulx . .
Bridlington (planned for Vault).
Netley . . .

FIG. 260.—Development of Abutment in Aisle Bays.

Broadly speaking, the Norman builders had taken the vault problem up to this point when the Conquest took place—that is to say, the aisles were groined, but the nave was left with a wooden roof, as at Jumièges. At Boscherville the aisles were groined and the nave was spanned at intervals by transverse arches carrying diaphragm walls, supporting the roof portions and serving as fire-resisting compartments.

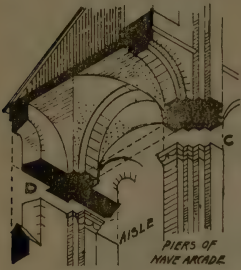


FIG. 261.—Groined Vault over Aisle.

Thus, in the XIth century it became the normal practice to vault the aisles in England, as at Norwich (Fig. 58) and Gloucester. The structural ordinance of the early post-Conquest building ideal is shown at Ely nave. (Fig. 55.)

Some French Examples.—On page 333 are shown some examples of early French attempts at the solution of the problem of constructing a vault over the entire church. Three of the examples given have barrel vaults over the nave. (Fig. 262.)

At Issoire there is no clear-story and the rampant half-barrels over the triforium immediately abut the central span. Note also the provision in Figs. A, B, and C (and also its retention in Fig. D), of the transverse arches T. A., or "*arcs doubleaux*," projecting beneath the main surface of the vault. These were introduced, together with buttress piers, in order to stiffen the vault and wall structure at intervals, acting as a kind of permanent *centering* in case the supports yielded under the continuous pressure of the barrel vault.

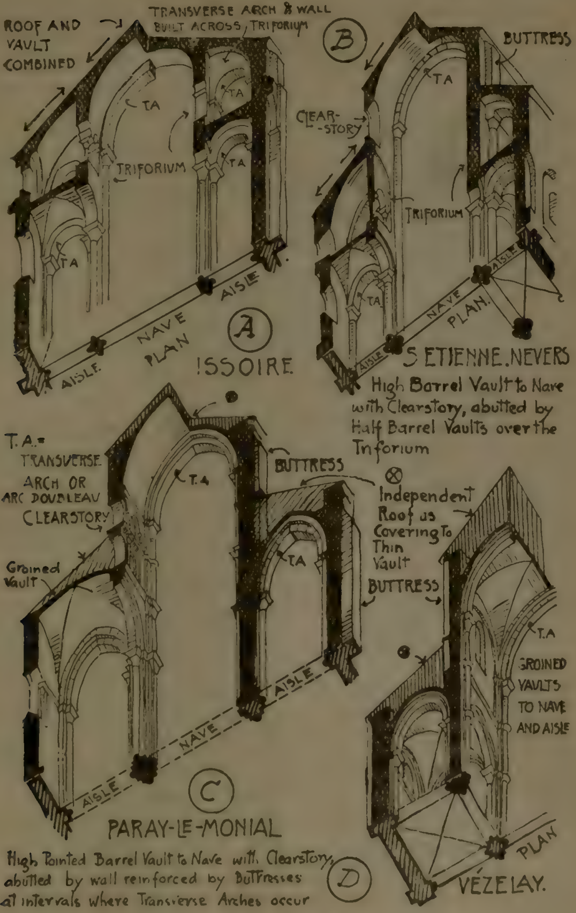

ROOF AND VAULT COMBINED
TRANSVERSE ARCH & WALL BUILT ACROSS TRIFORIUM
TA
TA
TRIFORIUM
TA
TA
AISLE
NAVE
PLAN
AISLE
A
ISSOIRE
B
BUTTRESS
TA
CLEAR-STORY
TRIFORIUM
TA
AISLE
NAVE
PLAN
AISLE
S ETIENNE. NEVERS
High Barrel Vault to Nave with Clearstory, abutted by Half Barrel Vaults over the Triforium
T.A. = TRANSVERSE ARCH OR ARC DOUBLEAU
CLEARSTORY
Groined Vault
T.A
BUTTRESS
TA
AISLE
NAVE
AISLE
C
PARAY-LE-MONIAL
High Pointed Barrel Vault to Nave with Clearstory, abutted by wall reinforced by Buttresses at intervals where Transverse Arches occur
⊗ Independent Roof as Covering to Thin Vault
BUTTRESS
T.A
GROINED VAULTS TO NAVE AND AISLE
PLAN
D
VÉZELAY.

FIG. 262.—Early French Vault Systems.

At St. Etienne, Nevers (*c.* 1099), in order to light the nave with a clear-story, the risky experiment was tried of raising the nave vault, as shown in Fig. B, relying on the isolated pier buttresses, triforium, and aisle vaults, to withstand the thrust.

At Paray-le-Monial (*c.* 1104) the vault is made thinner and consequently lighter, and a *pointed* section employed for the nave barrel vault to bring the thrust more directly vertical.

Fig. D shows the arrangement adopted (*c.* 1104) at Vézelay. Here the groined vault is boldly elevated above the triforium, and ample clear-story lighting obtained, but at the cost of stability. The wall abutment and small buttresses proved unequal to the work they were called upon to do.

Constructive Difficulties.—These Romanesque groined vaults were constructed of either dressed stone (page 335, Fig. V) or of rubble (rough stone bedded in mortar), according to local facilities; consequently they were thick, heavy, and of tremendous thrust.

Moreover, there was another defect: the depressed curve of the diagonal intersection.

On page 335, Fig. IV, is shown the plan of a groined vault, A. B. C. D. (By this we mean a plain intersecting vault *without ribs.*)

Fig. III shows the arch structure shown in perspective from above, while Fig. V gives a view from beneath, showing in more detail the construction and arrangement in dressed stone courses.

A B C D is a square on plan, each of the containing and generating arches, A E′B, B E′D, D E′C, C E′A, is semicircular; the crowns E′, E′, E′, E′, are all on the same level as the crown of the intersecting groin G′.

It will be seen, then, that the groin arches, A G′ D, C G′ B, though far greater in span than the outer

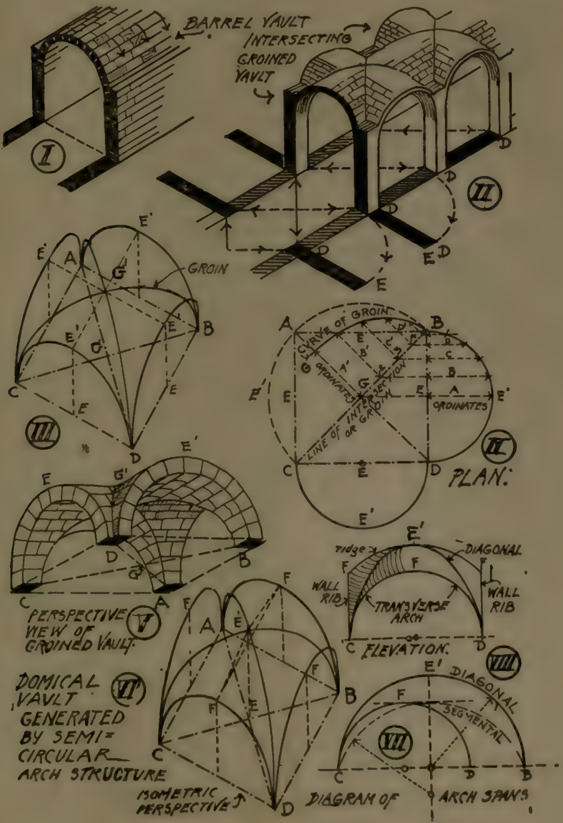


FIG. 263.

arches, A E′ B, etc., are no higher at the crown than these latter.

This means briefly that arches A G′ D, C G′ B are elliptical in curve and structurally weak, considering the concentration of weight and thrust they support.

The geometrical method of obtaining the groin curve, B G′ C, is shown on the plan (Fig. IV); the dotted line, C A B, shows the comparative height of a true semicircular arch for the same span.

In setting out a diagram of vaulting, the plan is first drawn as at A B C D, joining points A D, B C.

Next we mark the crown of each arch in the centre of the span, as at E and G.

Then lines A E B, B E D, B E C, &c., represent the position of the arches as seen from above.

To compare the different arches we proceed as follows.

The lines, B D, D C, are taken as representing the *springing* lines of the arches B E D, D E C, which in this case are semicircular.

With centres E and distance E B, E D, we lay down horizontally the true curve of the arches B E′ D, D E′ C.

If the intersecting arches, A G D, B G C, were also semicircular, as they are in the vault, Figs. VI, VII, and VIII (which we shall deal with later), we should then proceed in like manner with centre G on line B C as *springing*, and distance G B or G C to describe the arc, C A B, shown in dotted line.

Turn to page 351, and compare the skeleton vault plans, Figs. IV and V, where the positions of various arches are shown in plan by straight lines, and their varying curves drawn geometrically above from their *plan* line, which at the same time serves the purpose of marking their *springing* line, thus enabling them to be easily compared.

To return to the groined vault. (Page 335, Fig. IV.)

As the arches A G D, C G B (called the "diagonals" in a ribbed vault), are not semicircular, to find their elliptic curve we divide one of the generating arches, say B E′D, into a number of equal parts as at B E′, drawing lines parallel to one side of the square A B till they cut the diagonal arch B G C in the points G^2, ^{3}, ^{4}, ^{5}.

Draw lines through these points at right angles to B G C, Ga′, 2b′, 3c′, etc. *(See Note* at end of next para.)*

Measuring off the height of each ordinate, a, b, c, d, etc., from the springing line B D to the curve B E′ of arch B E D, we transfer these to the diagonal B C, as at Ga′, 2b′, 3c′ 4d′, etc. (*The Ordinates, a, b, c, d, and a′, b′, c′, d′, are marked in Diagram IV, on page 335, in *small* capitals.)

Draw a curve through the points so obtained, which gives half the curve, B G, formed by the intersection of two half-cylinders, B D, D C, on line B G. (See also diagram, page 329.) The same operation is repeated to complete the diagonal curve, B G C, on line B C. For ease and simplicity in construction it was desirable that a groined vault should be set out on a square plan; but in a big church it was not always possible to manage this, and in course of time the Romanesque builders became very skilful in vaulting not only oblongs but other irregular shapes. In the groined vault the inter-penetrating vault surfaces, half-cylinders and the like, were the dominant factors in determining the curvature of the intersection.

The Rib ousts the Groin.—The next step was important, and this was the substitution of a series of *independent arches* or *ribs* forming the skeleton or salient angles and setting out of the intersection of the vault, and the filling in of each cell or compartment between adjacent ribs, at first by rubble, and then later by arched courses of masonry bearing on the backs of these ribs. (Figs. 72, 265, 266, 273, 275, 280.)

The employment of these ribs had long been foreshadowed by the use of those transverse arches, or flat ribs, beneath the soffits of barrel vaults, and sometimes between the adjoining bays or compartments of groined vaults, introduced, as we noted before, with a view of supporting these vaults, and acting as permanent centering in case of a settlement occurring or structural failure supervening.

These *independent ribs* henceforth give the dominant factor in vault design. They greatly facilitated the covering in of irregular spaces, and no longer was it so necessary for all the arches to be of equal span and height.

The first change was made in the curve of the diagonal arches. The elliptical arch was superseded by a semicircular or a segmental curve.

The Rhenish or German Romanesque school, influenced by Byzantine traditions, had adopted a domical form of groined vault with all the arches approximately semicircular—a distinctive feature of their style.

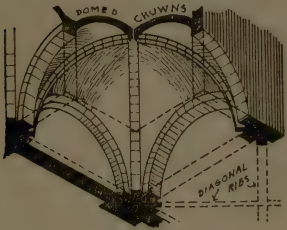


FIG. 264.
Domical Vault.

The Anglo-Norman school seem to have complicated the vault problem by assuming that it was desirable not only that all the arches of a bay, or "severy," of vaulting should spring from the same level, but that their crowns should be approximately level too. This was a counsel of perfection. They aimed at this result, but for a long time could not achieve their purpose.

In order to obtain level ridges they employed depressed, stilted, and segmental arches in combination with semicircular, as at Durham, Peterborough, etc.

Then the arches no longer sprung from the same level, and the builders soon began to find the semicircular arch and its variants far from tractable. Besides these, their light ribs had an increased tendency to *buckle at the haunches* (as it is technically termed) if the abutment yielded or rib structure was weak. (See p. 322, Fig. 255.)

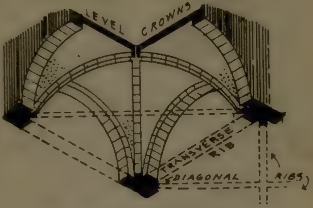


FIG. 265.—Ribbed Vault with Segmental Diagonal Ribs and level Ridge.

THE POINTED ARCH SUPERSEDES THE SEMICIRCULAR ARCH.

So at last, but reluctantly, the builders took the final step, and adopted the pointed arch in place of the semicircular.

This enabled them to bring down the thrusts more vertically and to pitch the crowns or ridges of their vault arches at the most convenient level, giving them a freedom of structural play never before attained. No longer were they tied to the square as the standard type of vault plan, but were at one bound enabled to attain their longed-for goal by employing a parallelogram instead of a square for the setting out of the high vault, making one bay of the nave range with one bay of the aisle, and so bring the general vault scheme into harmony.

More than this, in the apsidal eastern ends of the French churches the builders were in a position to freely vault pentagons, trapeziums, and other irregular shapes, with grace and ease.

Let us, however, return for a brief space to the high-groined vault over a nave with aisles. In England we have no examples left, as from the first we seem to have concentrated our attention chiefly on the development of the ribbed vault applied to both nave and aisles.

If the provision of weight to steady the piers of the nave arcade against the thrust of the aisle vaults had unduly increased their sectional area, much more, therefore, did the employment of a high-groined vault necessitate their being made still larger. The span being wider the weight was correspondingly heavy, besides the additional thickness of clear-story wall and pier buttress, to abut the thrust acting so dangerously high up.

Flying Buttress to strut the Vault.—The employment of a lofty wall acting both as an abutment and support to the high vault was therefore objectionable; the bulky piers cumbered the interior of the edifice, the method was extravagant in material, and relatively inefficient in practice.

The introduction of the ribbed vault and its consequent extension to the high vault did not make matters less easy of solution. It became more and more imperative to securely abut the vaults now that the ribs were independent, so that at Durham we find the high vault kept low, springing from below the clear-story cill, and transverse arches built across the triforium chamber to abut the vault springing *beneath* the roof of triforium. The principle of the *flying buttress* is introduced. (*See* Fig. VIII, page 3.) Then

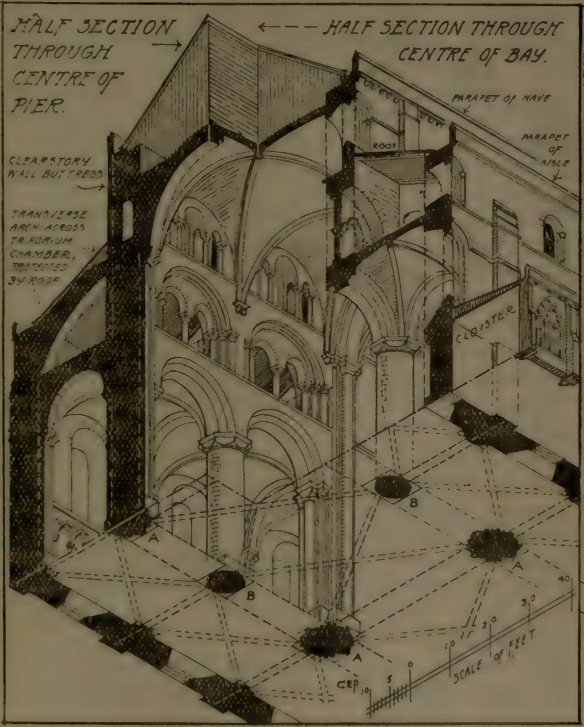

HALF SECTION THROUGH CENTRE OF PIER.
HALF SECTION THROUGH CENTRE OF BAY.
PARAPET OF NAVE
PARAPET OF AISLE
ROOF
CLEARSTORY WALL BUTTRESS
TRANSVERSE ARCH ACROSS TRIFORIUM CHAMBER, PROTECTED BY ROOF
CLOISTER
A
B
A
B
A
CEP
SCALE OF FEET
10
5
0
10
20
30
40

FIG. 266.—Durham Nave.
Isometric Diagram of Structure.

the vault is raised gradually higher and the flying buttress follows its upward tendency, now appearing *above* the triforium roof and acting as a rigid stay to prevent the clear-story wall from being thrust out by vault pressure, and transmitting it across the aisle to the external buttress rising above the aisle walls, as at Canterbury (Fig. 115), Chichester, and New Shoreham.

We have now reached a stage of development when it became possible to build a stone vault over the whole of the church (with clear-story adequately lighting the central nave), and moreover to maintain the structure in stability.

In working out this problem step by step it has logically followed, as we have seen, that the pressures are at first found distributed, then gathered up and concentrated on a few points, as in the groined vault; then each independent arch in the ribbed vault picks up its share of the load, bringing it down on to the supporting pier or portion of wall support.

These definite loads being thus brought down on isolated points, the remainder of the intervening wall structure could be reduced in thickness, with great advantage as regards economy of material and organic character of the fabric, thus lessening unnecessary loading of the supports and foundations. Without injuring the stability of the building, the material could now be more judiciously and scientifically disposed, so as to obtain the maximum efficiency with a minimum of material. These two purposes were never lost sight of: constant increase of thrust and load concentration on supports which ever became more lofty and slender.

Hitherto the wall has been the primary means of support and abutment to the vault; in future the isolated points of thrust and load pressure tend to become independent, the surplus wall material is rearranged in buttress form, strutting these piers, placed so as to take the thrust. The external walls almost vanish as the window becomes ever loftier and wider, remaining only strong enough for lateral stiffness between the piers, and only thick enough to safely withstand the weather.

Walls ultimately become *enclosures* and not *supports*. Thus was obtained *economy of structure*, an object so dear to the heart of the mediæval builder, and this without endangering the safety of the fabric.

The early Romanesque walling was generally constructed of two outer faces of dressed stone, the core, or heart of the wall, being filled up with rough stones bedded in thick mortar joints. Such a method, it is plain, was ill-adapted for bearing concentrated loads, constituting a weakness recently seen in Peterborough Cathedral.

As we have before noted, the preciousness of stone which dictated to these builders this *economy of structure*, arose from the fact that often local stone was indifferent in quality, and that good stone might have to come from some distance; and even this in small blocks: first, owing to the quarry supply; secondly, from defective nature of transport, the country being at places impassable through forests, swamps and fens; thirdly, owing to the absence of complex mechanical contrivances for handling large blocks.

The myriads of unskilled labourers toiling at the behest of Imperial Rome on the pompous buildings of her proud dominion, and the commercial steam-crane and Scotch derrick of the XXth century, were constructional facilities alike denied to the mason-artist of the Middle Ages.

The majority of the stones used in the constructive triumphs of this most wondrous period were of such a size as could be handled by one or two men with the simplest of mechanical contrivances.

Most of the dressed stone used in the East Anglian churches came from Northamptonshire, the rest of the walling being constructed of the local flints bedded in mortar.

Anent the building of the great Abbey of Bury St. Edmunds in the XIth century, in addition to the stone from Barnack, Lydgate tells us Abbot Baldwin used

> "—Ston brought from Kane out of Normandye
> By the se, and set upon the strande
> At Ratlysdene, and carried forth by lande."

Rattlesden, Suffolk, is now right inland, and it is difficult to realise that the little brook was once large enough to carry boats laden with blocks of stone on its waters. It shows vividly the difference between the configuration of the country then and now. The streams sluggishly flowing through extensive swamps and marshes, which rendered water transport possible, at the same time hindered communication by land.

Not only was the Romanesque wall structure of rubble core unsuited to support heavy pressures, but these builders had to face difficulties through failure of foundations either through insufficiency of same or through the yielding of the ground.

Take, for example, say, a tower of a large church carried on four isolated piers and supporting a groined vault. If one of the piers showed signs of failure, either through weakness inherent in itself or from the foundation giving way, the probability was that the whole structure would fall. Even assuming that the defect was slight at first and not serious, the very heaviness of the fabric would hasten its ruin.

Elasticity of Structure.—To obviate failure of this kind, the masons of the Middle Ages adopted what we will call *elasticity of structure.*

Under the Roman system of construction, their Imperial edifices were built in an exceedingly massive manner, with a fine disregard for cost, albeit tempered strangely with wise and shrewd economy as to ways and means. Walls and vaults were constructed on a system of concrete masonry, homogeneous in structure.

The Romanesque builders, unable from economic reasons to follow this system, and yet knowing no other tradition, endeavoured, as we have seen, to build barrel and cross-vaults of rubble or stone carried on relatively thin and defective walling.

Insufficiently tied together, any failure of part of wall or vault generally resulted in the destruction of the whole or part of the building.

Then, having introduced the system of concentrated loads on independent supports, the later builders—profiting by the lessons learnt by previous failures—endeavoured to construct their buildings so that the partial failure of one pier or the spreading of a bay or cell of vaulting, should not of necessity seriously affect adjoining portions, and that the evil influences and results should be minimised as far as possible.

They ultimately succeeded in arranging, so that, though forming part and providing mutual support to the fabric as a whole, each individual bay and its constituent members, pier, arch, vault, cell, etc., should be more or less independent of those around.

If from unforeseen cause or accident local deformation or failure did occur, the elasticity, or *give and take*, of the component structural parts would permit this to take place to a greater or less extent without perhaps seriously affecting the adjoining portions.

Pier A might sink or partially deviate from the vertical without affecting its neighbours B and C; the connecting arches A B, A C, would accommodate themselves to admit of this unless the failure became dangerous or too serious. (Fig. 267.)

In place of *rigidity* the builders substituted *elasticity* between individual parts of the fabric.

Once this principle was fully grasped, the masons lost no time in elaborating it. The rubble core wall was discarded, and the heavily burdened points of support carefully built as piers of well-dressed stonework. The employment of these enabled a still greater weight to be carried on a given sectional area of square feet. It is instructive, for example, to compare the relative areas of the cross sections of the piers of Durham choir with those of Westminster, which are drawn to the same scale in Fig. 76.

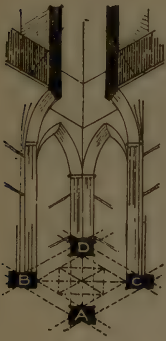


FIG. 267.
Elasticity of Structure.

This economy of stone, and the ever-increasing size and scale of the buildings, produced surprising results. The points of support become lighter; instead of the solid Romanesque walls, divided into clear-story, triforium, and pier arcade, with openings comparatively low and small, the Gothic builders threw open arcades from pier to pier. The triforium of monastic ordinance shrinks in size; the wall structure is all but suppressed; the pier arcade soars upwards; the spreading clear-story annexes the triforium and eliminates the wall between the drooping severies of the high vault: the tendency being ever in the same direction, with increasingly lighter and loftier walls supported by piers ever more slender. Compare, for example, the bay designs of Ely (Fig. 55), Durham (Fig. 266), Canterbury (Fig. 115), Westminster (Fig. 175).

Equilibrium of Structure.—The audacity of their constructive daring knew no bounds. They balanced a fragile vault on the top of one of these attenuated piers, kept in its vertical position by a system of arched abutment and lateral supports (the last survival of the eliminated wall) applied at the levels of (1) the aisle vault and nave arcade; (2) the triforium; and (3) clear-story; while the outward thrust of the sheaf of vault ribs was resisted by the external abutment of the flying buttress.

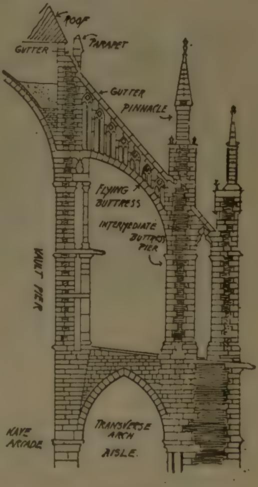


FIG. 268.
Amiens Cathedral Choir.
Equilibrium of Structure.

Naught but the dead weight of the materials necessary for pier, walls, structure and vault, was brought down within the edifice, the thrusts being transmitted and annulled externally.

This, of course, most particularly applies to France, and the system is seen fully worked out in the French Gothic cathedrals, especially Chartres, Rheims, Amiens (Fig. 56), Bourges, Le Mans and Beauvais;

this latter in very truth the last word of Gothic construction.

Is it not difficult to recognise in such a well-thought-out scheme, with its highly organised structure and scientific disposition of masonry, its primitive prototype the simple early Christian basilica?

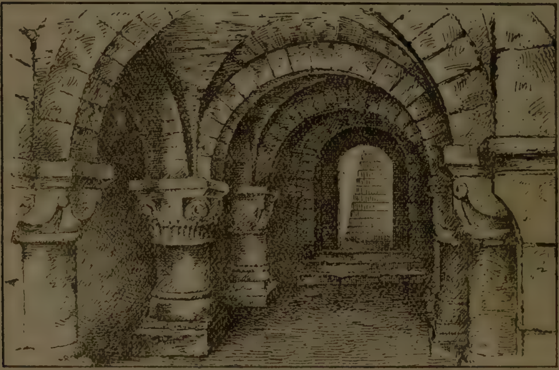


FIG. 269.—Lastingham Crypt.
Groined Vault with Transverse Arches.

Though some of our constructive triumphs in England are by no means to be despised, Gothic construction was never carried to such lengths as in France. The reasons for this we have already seen in Chapter IV; and a study of the course of French Gothic art, its aims and achievements, is necessary to thoroughly grasp the true inwardness of mediæval architecture in other countries.

CHAPTER XIII.

English Vault Construction.

English Methods.—Satisfied with a moderate internal height, English builders seemed to have disliked and distrusted the constructive gymnastics of the lofty external flying buttress, to the extent of often declining its aid, even when this course involved omitting the high stone vault. Moreover, the vault never became on this side of the Channel the one imperiously indispensable and central feature of Gothic construction, poised in mid air, to which all else was of secondary import. And this despite the fact that we in England perfectly understood the possibilities of vault design.

Perhaps this was owing partly to the fact that, side by side with the stone vault, we carried the development of the framed wood roof to a pitch of constructive and æsthetic propriety and perfection unsurpassed elsewhere.

Thus, having at our command the choice of the alternative schemes of a decoratively expressed timber or stone roof, we felt that either method was equally appropriate as exhibiting the scientific handling of Gothic constructive problems; not accepting the presence of the vault as absolutely necessary for the full expression of the Gothic spirit, nor regarding the wood roof as being but a makeshift apology for its absence.

For in the framed English mediæval roof, with its internal tie and shouldered wall abutment, was shown how equally habile and skilful were the craftsmen of the period in developing the constructional principle of the lintel of Classic times. When stone was not forthcoming as a material for building, they have demonstrated to us how, in the wood-built houses, gild halls and the like (which still exist in large numbers though in sad disrepair), that they were equally adept in the science and art of *framed construction.*

Moreover, a survey of our buildings shows that we never seem to have quite shaken off the Romanesque tradition of *wall support.*

Our cathedrals and churches are lower in proportion and heavier in structure than those of the Continent, and usually have not their highly organised verticality and tenuity of structure. (Plate, page 375.)

Thus the wall structure is never so entirely eliminated, even at Canterbury, Westminster, or Gloucester choir, as in contemporary French buildings. On the other hand, with a higher *factor of safety*, we were freer to devote our attention to elaborating and perfecting vault design, and our buildings are as artistic if not so dangerously and desperately logical and scientific.

Having thus reviewed briefly the structural arrangements which rendered it possible, we will consider in detail the development of the Vault in England. Space forbids our dealing with more than a few of the chief examples.

We traced the development of the groined vault at its first inception, either continuous or with each bay marked by a flat and broad transverse arch.

This innovation was hailed with delight, as enabling the aisle windows to be easily kept up to a high level, just below the soffit of the vault, rendering ample lighting possible. (Figs. 261, 263, II.)

No wonder, then, that the builders were so anxious to put such a vault over the central nave. Rather than use the central high barrel vault, involving either

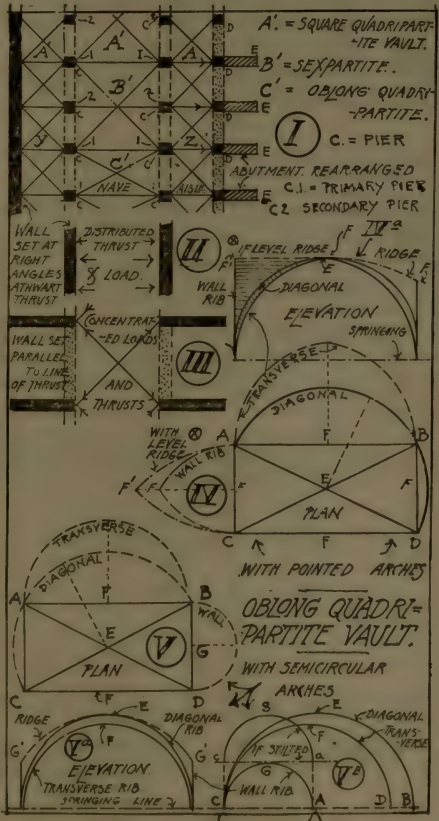


FIG. 270.

defective lighting or inadequate abutment, and often a combination and aggravation of both these evils, and mistrusting the bulky groined vault, as we have seen, with all its inherent difficulties, the Anglo-Norman masons chose rather to defer the question of the completion of the central high vault, and contenting themselves with an ample clear-story and wood roof instead—*e.g.*, Ely. (Fig. 55.)

The Ribbed Quadripartite Vault.—When independent ribs, however, were introduced, with all the extended facilities of construction which they offered, the builders then felt that the time had come to solve the problem of the ceiling-in of the central span in stone.

Fig. 263, VI, page 335, represents the arrangement of a bay, or severy, of a ribbed vault of, say, an aisle of this period. (A B, C D; see also Figs. VII, VIII, on the same page.)

A B, C D, = Transverse or cross arches or ribs, spanning the aisle from side to side.

A C, B D, = Wall arches, or ribs.

A D, C B, = Diagonal arches.

E′ = Point of intersection (boss or key stone) at crown of diagonal arches.

F = Crown of transverse and wall ribs.

AEC, BEA, DEB, CED } Independent vault cells. At first filled in with rubble, and later with arched courses of masonry, springing from rib to rib.

Each rib is independent and relatively elastic, each cell or panel of *infilling*, as A E C, is separately supported and arcuated; later again each course of stone in the panel is arched, and more or less resilient.

Compare this development, and note the progress from the concrete homogeneity of the Roman construction or the heavy inflexibility of the Romanesque groined vault, as at Lastingham or Norwich.

If, as in Figs. 263, VI, VII, VIII, page 335, the arches are all semicircular, then A B, B D, D C, C A, are equal in span and height, their crown level being marked F, F F F. The diagonals A D, B C are also equal in span and height. Note how these diagonals are much greater in span than the outer arches, and therefore the crowns of the former at E′ are at a higher level, and the vault consequently domical, F E′ F. (Fig. 264.) The French did not object to this, but generally an arrangement of level vault ridges was sought by the Anglo-Normans. (Fig. 265.)

To obtain this it necessitated either stilting the outer arches or dropping the diagonals, by employing either a segmental or an elliptical arch instead of the semicircular form (Fig. 72), or the concurrent employment of these or similar expedients.

With an oblong severy matters were worse, as at Fig. 270, V, V^a, V^B. Here the diagonals A D, B C, are longer in span and higher than the transverse arches, A B, C D, which in their turn are greater in width and height than the wall arches, A C, B D; thus there are three different apex levels, E, F, and G.

To get these all to range, it became necessary to depress the diagonals and raise or stilt the wall arches, which often entailed twisting the surfaces of the vault cells adjacent to the clear-story windows. This is termed "ploughshare" vaulting.[1]

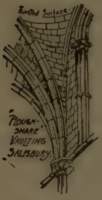


FIG. 271.

Ultimately, by adopting the pointed arch, the builders at one step were enabled to simplify matters.

At first the semicircular arch was retained for the curve of the diagonals, while the pointed arch was employed for transverse and wall ribs. Finally, the pointed arch was used throughout, each rib being given the most convenient curve, as in Figs. IV, IV^a.

But earlier than this, amongst the *Northern* School, Durham was the foremost of our great Romanesque churches in tackling the problem of the quadripartite ribbed vault. Commencing with the ribbed vaults of the choir aisle (*c.* 1093–99), she went boldly onward till the nave roof (Figs. 56, 266) was achieved (*c.* 1140). Lindisfarne (*c.* 1125) possessed high vaults, but no other examples of ribbed vaults over *aisled* buildings of early-XIIth-century date exist now, though there are still plenty of examples of these over *unaisled* structures—*e.g.*, Kirkstall choir, Hemel Hempstead chancel, etc.

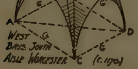


FIG. 272.

In Normandy the vaults of Lessay are probably contemporary with Durham.

Other examples of the early introduction of the pointed rib are found in the two western bays of the south aisle, Worcester Cathedral (*c.* 1170), and Glastonbury Lady chapel (*c.* 1184—1186), whence we pass on to Wells nave, examples of the first Gothic Art of the *Western* School.

---

[1] *e.g.*, Westminster and Salisbury.

Roughly speaking, it was the normal Romanesque practice to set out the nave twice the breadth of the aisles, with a timber roof, or may be, a barrel vault to the central span, and a groined vault to the side aisles, set out on the basis of a square—*e. g.*, Ely nave (Figs. 55, 207), Boscherville (Fig. 57), Issoire (Fig. 262), etc.

When it became a question of putting either a groined or a ribbed square-planned vault over the nave, it is seen that one bay of the central nave embraces two of the aisles. (Fig. 270, I^A.) That is to say, that only the alternate piers of the nave arcade support the high vault, as at Spires Cathedral and Boxgrove Priory, Sussex. (Fig. 270, I^A.)

This system of *alternating supports*, usual in the Romanesque churches of Lombardy and the Rhine (*e. g.*, S. Ambrogio, Milan; S. Michele, Pavia; and Spires Cathedral) was not felt to be quite satisfactory in France and England.

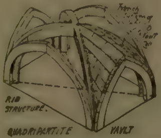


FIG. 273.

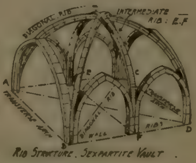


FIG. 274.

The Sexpartite Vault.—With a view to associating all the piers of the nave in the work of supporting the high vault, and as well as strengthening the quadripartite vault and subdividing the cells when employed on such a large scale, another transverse rib was introduced, supported by the intermediate piers, meeting the crown of the diagonals and dividing the *four*-celled vault into *six* cells. This was termed the *sexpartite* vault. The rib structure is shown at Fig. 274, page 355, and the plan system at Figs. 144, 270, I^{B}. This was the normal French method till about 1200. It was never popular in England, though used at Canterbury choir by William of Sens (Figs. 114, 115), and Lincoln transept (Fig. 160).

This system was not perfect, the wide span of the diagonal arches not only unduly exalted the level of their crowns above the other ribs, but worse still, it increased at the same time their thrust, and the loading of the primary and secondary piers was far from being constructionally or æsthetically equal. Our predilection for the logic of the oblong severy all but caused us in England to regard the sexpartite vault as not being much better than a temporary makeshift.

With the advent of the pointed arch and use of the oblong plan for each high severy, unity in bay design was at last attainable, as in Fig. 270, I^{C}, page 351. One bay of the nave is equal in depth to one of the side aisles—*e.g.*, Salisbury (Figs. 7, 8), Westminster (Figs. 175, 180).

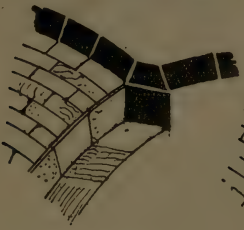


FIG. 275.

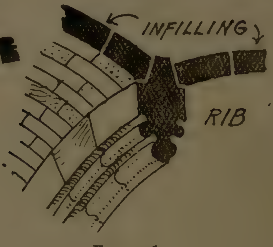


FIG. 276.

Infilling of Vault Cells.—When arched courses of dressed stone succeeded rubble as the method of filling in the *web* of the vault or space between each independent rib, at first these courses of infilling rested on the back of the vault rib, as in Fig. 275, but later these were "rebated" or checked out to receive the springing of the web courses, as Fig. 276. These were supported, while in course of construction, by a temporary *centering* (resting on the vault ribs), an extensible template called a "*cerce*" consisting of two planks cut to a curve, sliding on one another slotted, and kept in position by pins. (See Fig. 277.)

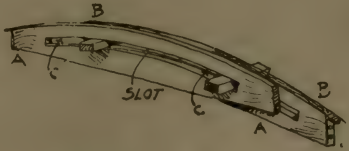


FIG. 277.—The "Cerce."

The mediæval masons were not less anxious to judiciously economise in the materials which formed the permanent structure, than they were to reduce expenditure and money and labour on the *temporary* structures and mechanical appliances and expedients so necessary for the erection of the edifice. The employment of the arch predicates the necessity of providing temporary support for the voussoirs composing it till all are fixed in position and complete, when it becomes self-sustaining. This temporary structure is called the *centering*, and is usually of wood, and it is interesting to see the marks of the wood grain and splinters of the centering remaining in the mortar of the XIth century vault in the crypt at Lastingham.

Though, owing to the mediæval forests, timber was plentiful, yet, as there were no steam saw mills in the Middle Ages, the conversion of the rough wood into planks and baulks, etc., involved hand labour. The larger and deeper the arch, the more expensive the centering, so that the barrel and groined vaults, with their heavy structure, were costly to construct.

A vault with independent ribs required only light centres for the generating arches and the *cerce*, or some light planking would be all, roughly speaking, that was requisite in the way of temporary appliances for its speedy construction.

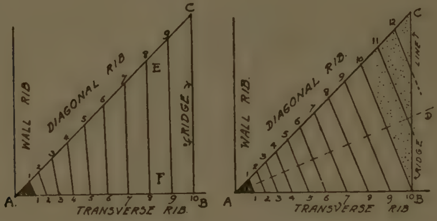


Fig. 278. French System. **Fig. 279.** English Method.

Infilling of Vault Cells.

With regard to the actual system adopted in building up the courses of infilling, French and English practice diverged, and this difference greatly influenced the vault development in England.

The French method was to divide the lengths of the diagonal and wall, or transverse arches, as the case might be, into an equal number of parts or courses, as in Figs. 273, 278; this gave a straight joint at the apex, B C. Each course of infilling was therefore roughly wedge-shaped, and was slightly arched as well, for the diagonal arch, A C, is longer than the transverse, A B, therefore the end of course, E F, is wider at E than at F. The courses are set roughly at right angles to the *external* arches, as at A F C, Fig. 280.

Compare the English practice (Figs. 279, 280), which was to allow each course to be equal in breadth at both extremities, being either set out at right angles or thereabouts to the *diagonal* arches, or the angle between the diagonal and external arch was bisected, as at A D, Fig. 279, page 358, and the courses are set out at right angles to this.

This gave an irregular and serrated junction at the crown (Fig. 280, E G, E H, E K), which is not so satisfactory or strong as the French system shown in cell A E C.

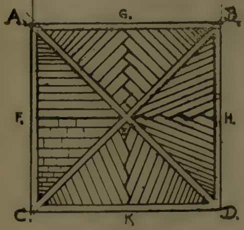


FIG. 280.
Infilling of Vault Cells.

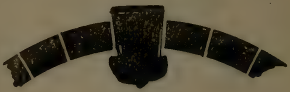


FIG. 281.—The Boss.

The Ridge Rib.—Now partly to mask this, and partly to strengthen it, and also because of the Anglo-Norman tradition in favour of level ridges, another rib was added to the vault, called the *ridge rib*, as at E F or G H. (Fig. 144, page 186.) The result of this step primarily originated all the later complexity of design. Now in a large quadripartite vault, A B C D, the distance between E G or E H, *i. e.*, length of ridge rib, would be certainly too large to be safely spanned by one stone. Or even if possible, such length might not be the easiest to obtain. (Fig. 280.)

To employ small stones, then, in such a horizontal position, involved either arching such a ridge rib, which would at once cease to be level, or the provision of some other means of intermediate support.

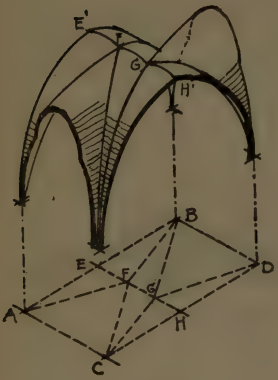


FIG. 282.
Vault, Lincoln Choir.

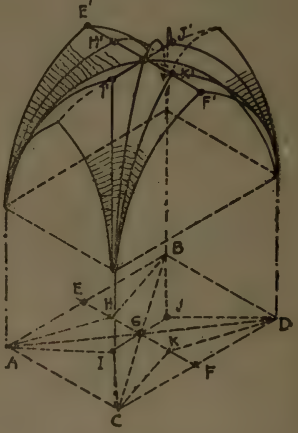


FIG. 283.
Vault, Lincoln Nave.

Variants of the Simple Quadripartite Vault.—So it is at Lincoln choir, where we find the problem of the ridge-rib first solved in a novel and irregular manner. (See Figs. 118, 160, 282.) The longitudinal ridge rib, E H, alone appears and is supported thus. The total length, E H, in each bay is divided into three parts, E F, F G, G H, and in place of the usually arranged through diagonals, three ribs, as A F, C F, B F, and C G, B G, D G, converge on each side of the central span, as shown at points F and G.

The Boss.—At the same time another feature makes its appearance, to wit, the *boss.* (Fig. 281.) This was a large stone placed at the junction or intersection of two or more pairs of ribs, and formed one common keystone against which they mutually abutted. It was, moreover, found difficult to always get the mouldings of ribs meeting obliquely to *mitre* neatly at their junction. By carving the bosses with wreaths of foliage, the builders were enabled to mask any irregularity of this kind, and the bosses of the vault became a most beautiful decorative feature, sometimes elaborately carved with figure subjects or charged with symbolic ornament. How well these old masons knew how to turn stern structural necessity to æsthetic account! Sometimes, indeed, they discarded the boss, and, in order to show their dexterity, constructed complex vaults with deftly mitred ribs, as at Bishop West's chantry, Ely Cathedral.

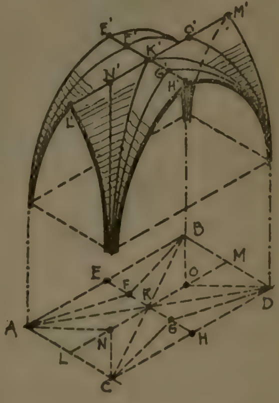


FIG. 284.
Vault, Lichfield South Transept.

Tierceron or Branch Vault.—After employing the sexpartite vault in the main transept at Lincoln, the normal oblong quadripartite vault is reverted to in the nave (Figs. 160, 283), plus the longitudinal ridge, E F, and a short *transverse ridge*, I J, only going part of the way towards the wall on each side, with additional intermediate ribs or *tiercerons*, A I, C I, B J, D J, springing between diagonal and wall ribs and abutting the transverse rib at I and J, with other tiercerons as well at A H, B H, C K, and D K. A similar arrangement was adopted in Ely presbytery, *c.* 1235—1252. (Fig. 163.)

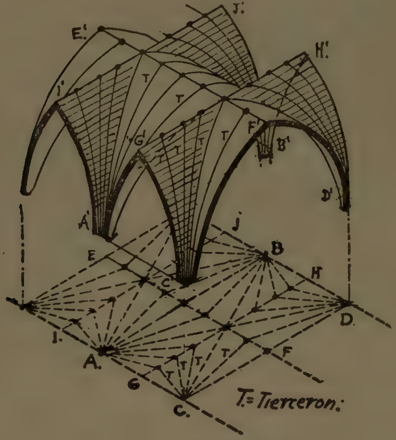


FIG. 285.—Vault, Exeter Nave.

In Lichfield south transept vault, Fig. 284, page 361, the transverse ridge, L M, runs through full width, and extra tiercerons are introduced between transverse arches and diagonals at A F, B F, C G, D G, and between wall arches and diagonals at A N, C N, B O, D O; while at Lichfield nave (*c.* 1250) a revised edition of Lincoln choir is given, the transverse arches between each bay being suppressed. (Fig. 288.) But both these two latter examples are abnormal, yet are characteristic of the experimental zest of the old builders.

Adding more tiercerons to the Lichfield south transept type we obtain the sheaf-like vault of Exeter nave (*c.* 1308—1350). (Fig. 285, Plate, page 177.)

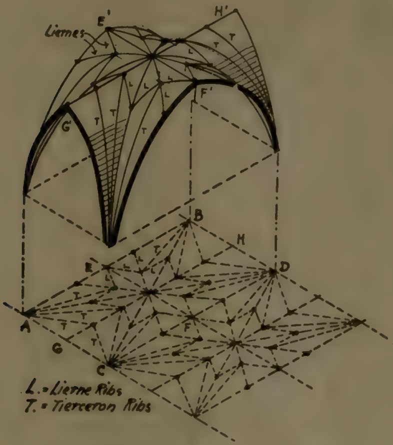


FIG. 286.—Lierne Vault, Ely Choir.

Lierne Vault.—Meanwhile it was felt that in a vault, like Lichfield south transept, the oblique tiercerons required further abutment, and this was done by continuing the line of the tiercerons, A F, A N, etc., onwards and downwards from F N, etc., till (as in Figs. 144, 286, 289) they abutted on the opposite diagonals or tiercerons as at L, L, L, L. These short ribs marked L T are called *lierne* ribs (Fr. *lier*, to bind).

These *lierne* ribs differ from the *tiercerons*, inasmuch as they spring from a *rib* and *not* from the *vaulting* *shaft.* With the advent of the lierne came a corresponding increase in the number of bosses. Once this principle was admitted, the idea was rapidly elaborated, and the liernes multiplied as at Ely choir (*c.* 1322). (Fig. 286.) From being originally constructive they tend to become more and more purely decorative. Ridge ribs are tripled, as at Gloucester choir (1337—1357), where (in Figs. 225, 228, 229, 287 below) by doubling the diagonals, A D, A M, B C, B L, spanning, and so coupling up, two adjacent bays, A B D C and D C L M, a combination is obtained of a central ribbed barrel vault, X X X X, inserted between the two halves of a normal quadripartite vault. The diagram (Fig. 287) gives the main lines of the ribs.

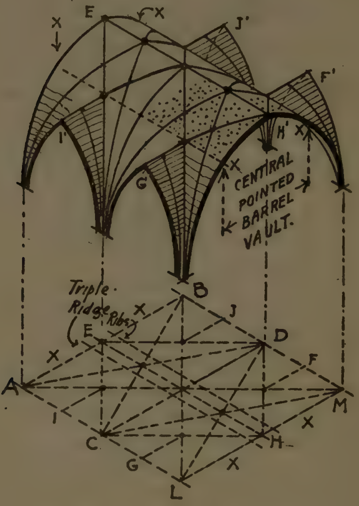


FIG. 287.—Vault, Gloucester Choir.

The reticulated system of liernes subordinate to these main lines is omitted for simplicity. Similar to this is the vault of Tewkesbury nave.

It was, as we have seen, one of the early and dominating principles of vault design to give each rib of a severy its own independent curvature, which rule was adhered to at first when the advent of the tierceron multiplied rib structure.

The lower portion of the overhanging body of vault structure, in form like part of an inverted curvilinear cone or pyramid, determined and bounded by the curves of wall, diagonal, and transverse ribs, is called the *vault conoid*.

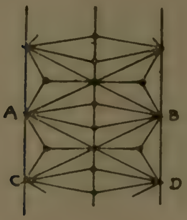


FIG. 288.—Vault, Lichfield Nave.

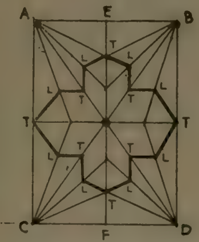


FIG. 289.—Lierne Vault, Abbey Gate, Colchester.

In French practice, owing to the stilting of the wall ribs, necessitated by the breadth and height of the lofty clear-story windows, and also to obtain further abutment to the converging and descending ribs, a plan through the haunches of the vault, about half-way up, is usually a trapezium or almost triangular in form. (Fig. 290.) In England it more usually approaches a rectangle. (Fig. 291.)

Therefore, to lighten the overpowering and almost oppressive effect of this mass of masonry, which the buoyant rib redundancy of English practice rather emphasised than rendered lighter, our mediæval builders began to *contour* the plan outlines of the conoid, re-arranging the projection of the ribs in a polygonal form as shown in diagram (Figs. 291, 292, 293, 294), a development which may be studied in the bays of the cloister vault of Norwich Cathedral.

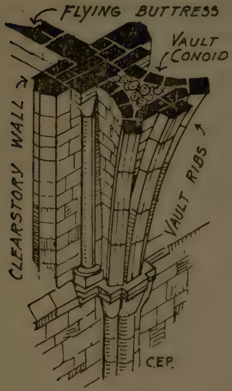


FIG. 290.
French Vault Conoid.

In order to reduce the salient accent of the diagonals, they proceeded to make the curves of the various ribs approximate to each other. Finding, then, that the employment of a common simple curve for all the ribs of the conoid was not compatible with keeping the ridge lines level, they seem to have substituted a compound curve formed of two arcs, so as to be applicable to all the ribs. The trend of

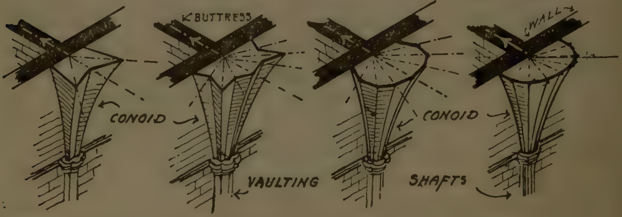


FIG. 291. FIG. 292. FIG. 293. FIG. 294.
Contouring of English Vault Conoids.

development was, that the vault conoid from being rectangular on plan became roughly polygonal and then semicircular. Willis suggests that this had a practical purpose by providing mutual abutment between the descending ribs, and so preventing buckling at the haunches. Thus seems to have originated the *fan vault* and also the use of the four-centred arch, each half of which is formed of a compound curve or combination of two arcs of a circle.

Late Vault Construction, Fan and Lierne.—We have seen, then, how this close juxtaposition of ribs, tiercerons, liernes and ridges, tended to cover up and mask the web or infilling of the vault.

The fan vault appears in Gloucester cloister, *c.* 1351

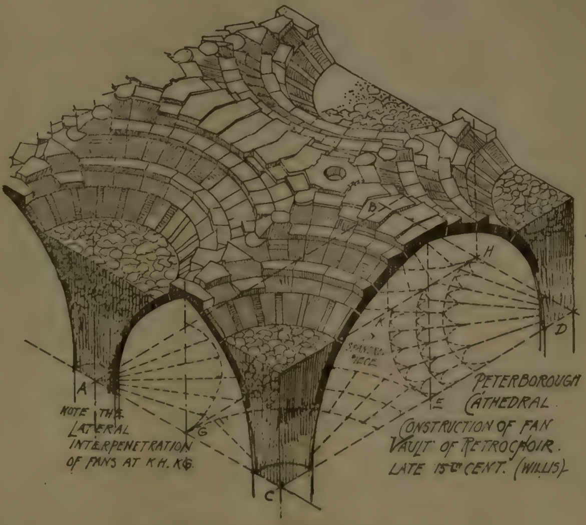

B
H
K
K
D
SPRINGING PIECE
A
G
E
C
NOTE THE LATERAL INTERPENETRATION OF FANS AT K H. K G.
PETERBOROUGH CATHEDRAL.
CONSTRUCTION OF FAN VAULT OF RETROCHOIR.
LATE 15TH CENT. (WILLIS)

FIG. 295.—Construction of Fan Vault.

—1377 (Figs. 232, 296), and the XVth century saw this system further developed, as at Peterborough retrochoir (Fig. 295) and Sherborne nave (1475—1504). King's College Chapel next follows in importance, with its vault begun *c.* 1512, culminating in the daring construction of Henry VIIth's Chapel at Westminster. We have good cause to be proud of this English achievement of the fan vault.

Meanwhile various combinations were tried elsewhere with the lierne vault, in competition with, and influenced by, the structural developments initiated by its aspiring and younger rival. The vault of Winchester nave follows on previous lines; so likewise that of Norwich (*c.* 1463–72), where, however, one notes, as in the earlier cloisters before mentioned, the contouring of the conoids.

At St. George's Chapel, Windsor (Fig. 300), we meet again the combination of lierne vault and central barrel of Gloucester choir; but here executed with certain modifications, recalling in treatment the appearance of the true fan vault. The depressed curve of the central span and the closely rib-sheathed conoids both testify to its influence reacting on the earlier type.

We have noted how the tradition of the level ridge, transverse and longitudinal, had been an integral part of English practice, and how, in order to obtain this horizontality, the builders had willingly sacrificed the simple for compound arch curve, and by contouring the conoids as well had evolved the fan vault. Also, that the oblong severy had always been regarded as the only orthodox basis of setting out the high vault bays.

When set out on a square plan, as at Gloucester cloister (Fig. 296), the outspread fan vault was simple enough to arrange, each conoid touching those adjacent, as at E, F, G, H, and joining up easily with only a small flat spandrel piece, K, in the centre.

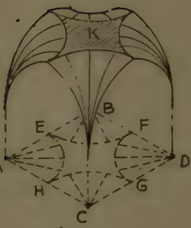


FIG. 296.
Gloucester Cloister.

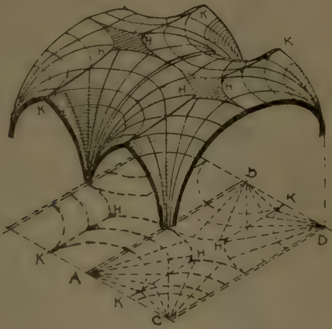


FIG. 297.
King's College, Cambridge.

Fan Vaults.

(Compare the construction of Peterborough retrochoir (Fig. 295), where a difficulty arises.)

For, applied to the oblong severies of the high vault, as at Sherborne nave or King's College (Figs. 242, 243, 297), the semicircular fan with its restricted radius could not swing across the nave and yet be complete.

The lateral interpenetration of the fans, as in the above examples at H, K, causes the transverse ridge line to drop downwards from the centre, as at Peterborough. (Fig. 295.)

But at Oxford Divinity Schools we see a striking and bold innovation. Here the problem was to vault a hall wide and low in proportion, so that the vault should not appear oppressive and too heavily dominant.

So we find bold transverse arches thrown across from side to side, and the lierne vault suggests a solution.

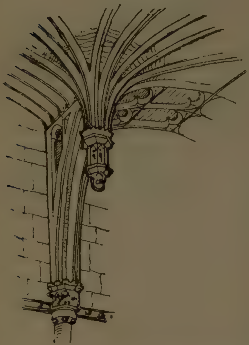


FIG. 298.—Vault Pendant and Transverse Arch. Oxford Cathedral Choir.

Half-way between wall and ridge on each side, one of the voussoirs of the transverse arches is elongated and dropped to form a pendant. Springing upwards from each is a complete circular conoid of ribs, which, drooping outwards to the centre, generates a square quadripartite vault (plus tiercerons and liernes), and revolving, joins hands with the wall conoids. By this constructive *tour de force* it was possible to vault this wide and low hall in a light and playful manner.

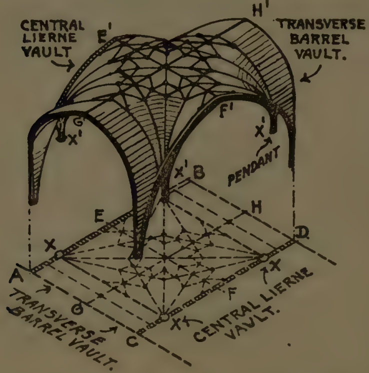


FIG. 299.—Vault. Oxford Cathedral Choir.

In the Cathedral choir (*c.* 1478—1503) the Oxford masons, not content with the above achievement, evolved another variant of the lierne vault (Fig. 299); employing again the constructive device of stout transverse arches, A E B, C F D (but disappearing behind the central portion of the vault at X F X), with dropped pendants at X supporting, as before, a square-planned lierne vault in the middle. This is set between transverse barrel-vaults, A C X X, B D X X, filling up the spaces between the outer walls and the pendant conoids, and springing off the haunches, C X, A X, B X, D X, of the transverse arches.

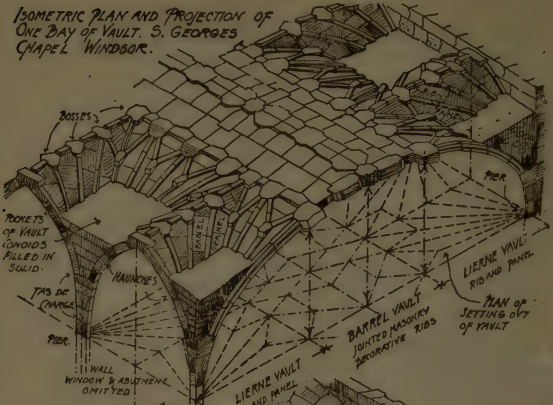
In both these complex vaults we notice that, except for the structural accent given to the great arches, the rest of the vault ribs are divested of any special importance and expression, and regarded purely from the pattern-making standpoint, and that the vault is taken *away* from the wall, as it were, and dexterously suspended and outspread as a canopy over the building.

We now pass on to survey the last example space permits us to study—the fan vault of Henry VIIth's Chapel, 1500—1512. (Fig. 301.)

Here the elongated pendants and transverse arches of the Oxford school are adopted, but in conjunction with the fully-developed fan vault of Sherborne or King's College, with its panelled and traceried surfaces, instead of the lierne rib reticulation. All the constructional ribs are suppressed and have gone, and this wondrous tectonic triumph consists of a thin *shell* of masonry built up in panels; the only reminiscence of the rib structure being suggested by the purely lace-like decorative tracery delicately wrought upon its surface.

We have, then, very briefly surveyed the evolution of the vault in England. It is interesting to note how that step by step, logically followed, it progressed,

FIG. 300.—St. George's, Windsor.


ISOMETRIC PLAN AND PROJECTION OF ONE BAY OF VAULT. S. GEORGES CHAPEL WINDSOR.
BOSSES
RIB
PANEL
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POCKETS OF VAULT CONOIDS FILLED IN SOLID.
HAUNCHES
TAS DE CHARGE
PIER.
LIERNE VAULT RIB AND PANEL
PLAN OF SETTING OUT OF VAULT
BARREL VAULT JOINTED MASONRY DECORATIVE RIBS
WALL WINDOW & ABUTMENT OMITTED
LIERNE VAULT RIB AND PANEL
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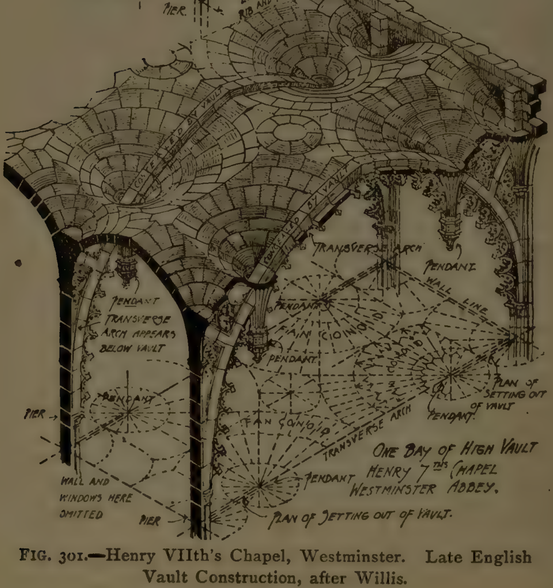
CONCEALED BY VAULT
CONCEALED BY VAULT
CONCEALED BY VAULT
TRANSVERSE ARCH
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PENDANT
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PENDANT
PLAN OF SETTING OUT OF VAULT
PENDANT
PIER
FAN CONOID
TRANSVERSE ARCH
ONE BAY OF HIGH VAULT HENRY 7THS CHAPEL WESTMINSTER ABBEY.
PENDANT
WALL AND WINDOWS HERE OMITTED
PIER
PLAN OF SETTING OUT OF VAULT.

FIG. 301.—Henry VIIth's Chapel, Westminster. Late English Vault Construction, after Willis.

finally all but returning to the type from which it originated.

It first appears as at the Saxon Repton, Fig. 10 (Xth century), or Norman Lastingham, Figs. 62, 269 (XIth century), all web, with or without transverse arches. Then, as at Durham (*c.* 1093), ribs are added.

The pointed arch then supersedes the earlier semicircular, and its variants the elliptical, segmental, etc. curves.

At Lincoln, ridge ribs and tiercerons are added. Further multiplication of ribs, as at Exeter; liernes then come crowding in, and the arch curves tend to become depressed; ribs run so closely, set in serried sheaves, so that a single panel suffices for infilling the attenuated area of the vault cell.

The fan vault is next evolved, with ribs oft carved on the panel pieces themselves, and then in Henry VIIth's Chapel even this last vestige of rib structure is eliminated, and its place taken by decorative panelling which covers the thin shell of the vault, now all web once again. The transverse arches supporting the pendants alone remain of the independent rib arches of the early quadripartite vault. The first to appear, they continue till the end. In this brief survey we have done no more than just to outline English vault development, and indicate some of the more prominent examples illustrative of the principles involved.

Broadly speaking, the standard type of vault of the French schools was the oblong ribbed quadripartite, with arched cells of infilling. We were quick to appreciate here in England how very lean and empty such a vault is apt to look when employed on a large scale, though perfectly scientific and constructionally sound.

This being so, there was on the Continent little need of constructive impetus to urge on further developments; hence the impress of its permanent tradition and use. There were other aims nearer the hearts of the masons across the Channel. Problems, as we have seen, of equilibrium, economy, and elasticity of structure to be solved, on which they bent their attention.

But the English masons, faced with a defect in their system of infilling, in correcting this, almost unconsciously introduced new factors and principles, which logically followed out, revolutionised vault design. Broadly speaking, then, the groined vault practically held its own till the end of the XIth century. The ribbed quadripartite then succeeded it, and became the typical vault of the XIIIth century, developing into the tierceron or "branched" variant. The lierne vault marks the XIVth century; while the fan vault is characteristic of the XVth and early-XVIth centuries.

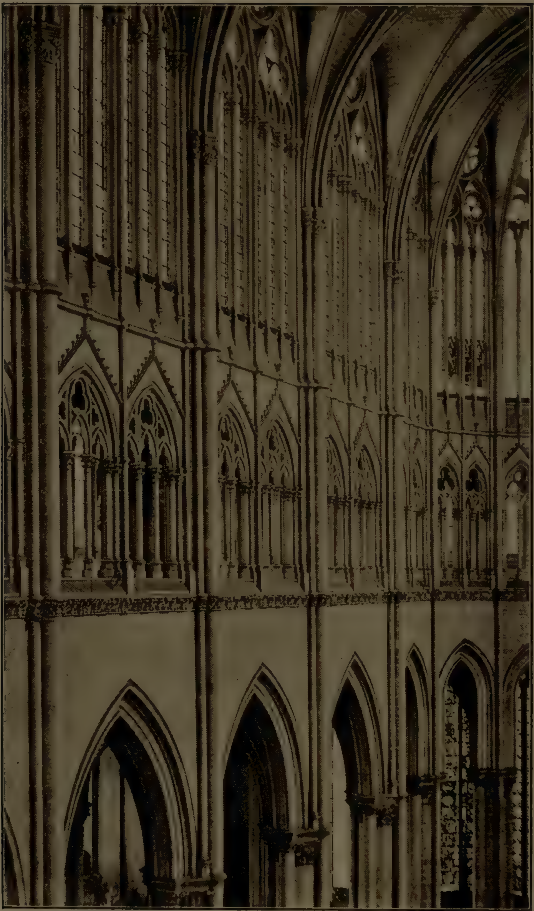


Photo. by H. T. Edwards.

Amiens. Choir.

CHAPTER XIV.

Abutment.

Let us now briefly survey the abutment scheme and study the expedients whereby the stone roof or vault was poised and maintained in mid air.

The wall employed as abutment has been explained previously, and also the subsequent arrangement of the wall material to form a buttress, placed *parallel to* and not *athwart* the thrust, and the reason for this development, especially as to vaults over unaisled structures. (Figs. 260, 263 (I and II), 270 (I, II and III).)

The buttress first appears as a flat pilaster, broad in the face and of slight projection. This was gradually increased in saliency, till it became square in plan and then in turn oblong, with breadth in the later examples considerably less than the projection from wall face. At first the buttress rose sheer from base to top, but when employed to abut the descending thrust of an interior vault, as in Fig. 303, A B D, it was seen that the whole of the mass of masonry, A B C, above the thrust line, B C, was not disposed to the best advantage. Some of it could be removed, so that the upper part of the buttress was set back, and an economy of material effected, as in Fig. 303, C^1 B^1 D.

As to the abutment of the high vault, the provision of this was even more vitally urgent than in unaisled structures, and at the same time was fraught with greater complications. (Fig. 75.)

We have seen how inadequate the lofty clear-story wall was to abut these thrusts, and also how that the construction of efficient buttresses at the high level was equally impossible without unduly and unnecessarily loading the internal piers of the nave arcade.

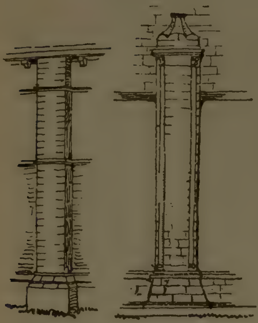


FIG. 302.—Early Buttresses.
Fountains. Glastonbury.

The simplest thing to do to prevent the clear-story wall being thrust out, was to put an inclined wooden strut or "raking shore" across the roof of the aisle, thus bringing the pressure to bear on the external buttress of the aisle wall.

Obviously such a method could be only a temporary expedient, owing to the perishable nature

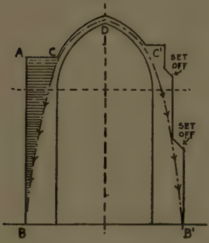


FIG. 303.
Diagram of Abutment.

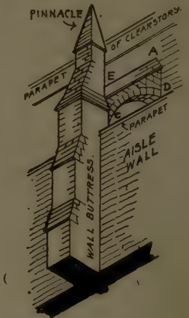


FIG. 304.
New Shoreham.
Abutment System.

of the timber. Instead, therefore, the masons built a permanent stone shore which we call a *flying buttress*.

This springs from the upper part of the external abutment pier, rising from and bonded to the lower aisle wall, which receives, and by its inert mass annuls, the thrust transmitted to it. (Fig. 1 (VIII).)

The flying buttress itself consists of two parts: an arch below, C D, usually supporting a wall spandrel-piece, which later becomes a stone strut, E A. (Fig. 304.)

The Pinnacle and its origin.—To further weight and steady the abutment pier, especially where the projection of buttress was restricted, and again also to prevent buckling of the arch haunch, or to check any tendency of the "raker," E A, to give way or slip, a pinnacle is built on the upper part of the buttress. Sometimes this is built to partly overhang the inner face of the buttress pier.

So likewise in the case of buildings where, owing to the more or less complete elimination of the wall, superseded by the wide and lofty window, as in the English chapter-house, and even when no vault thrust had to be combated, pinnacles were provided to buttresses, walls and clear-stories, to steady the structure.

Thus the pinnacle became a valuable constructive expedient by providing inert weight, an application in practice of the principle noted before on page 6. See also diagram, Fig. 1 (VI).

The builders were quick to turn this purely practical and structural auxiliary into a decorative feature of singular gracefulness.

Now the great defect of such a system of external abutment as this, was of course the fact that the vital parts of the structural mechanism, on which the stability of the vault depended, were unprotected and exposed to the weather.

The lofty proportions and arrangements of the French churches necessitated the adoption of this method of support, despite its defects and risk. But here in England it was felt that the lofty external flying buttress was a dangerous constructive expedient, and one which it were wiser not to employ.

Moreover, the lower proportions of our greater churches, the often frankly Romanesque character of their wall structure, compared with those of the Continent, rendered it possible to dispense with the aid of the external flying buttress in many cases.

Again, often we rather chose to forego the high vault, than trust to the support of the flying buttress, substituting a wooden ceiling instead, as at Hexham transept; or imitating the vault in wood construction, a sorry makeshift, as at York, where provision was made for flying buttresses, which, not being required, were omitted in actual execution. (Fig. 305.)

So likewise at Selby Choir. (Fig. 195.)

Concealed Abutment.—The first beginnings of the flying buttress were humble enough in their origin. In its earliest form it appears in Durham choir, where semicircular transverse arches are built across the triforium chamber (*c.* 1093). (Refer also to the section of Issoire, Fig. A, page 333.)

The next stage in the way of progress may be seen in Durham nave (*c.* 1133). The transverse arches spanning the triforium are no longer *semicircular* but a *quadrant* of a circle. (See Fig. 266, page 341.) A similar arrangement was intended in the triforium of Norwich choir (*c.* 1096).

We see the origin of the flying buttress in the rampant half-barrels over the triforia of Issoire or St. Etienne, Nevers. (Figs. A and B, page 333.)

If we substitute for the central high-barrel vault over

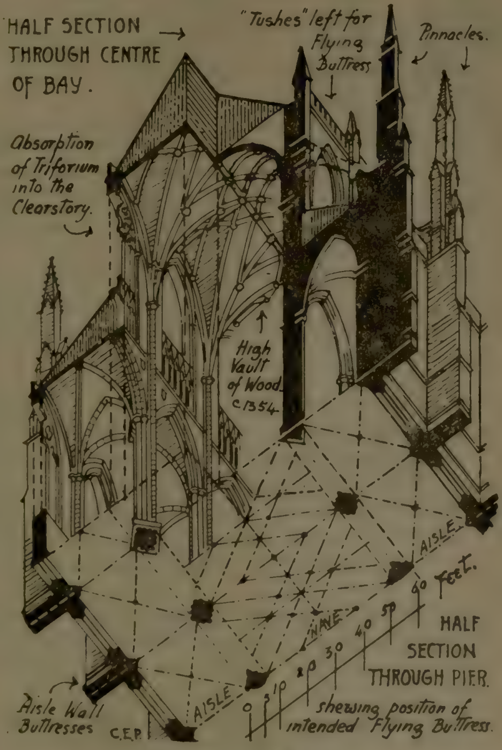

HALF SECTION THROUGH CENTRE OF BAY.
"Tushes" left for Flying Buttress
Pinnacles.
Absorption of Triforium into the Clearstory.
High Vault of Wood c1354
AISLE
NAVE
AISLE
0 10 20 30 40 50 60 feet.
HALF SECTION THROUGH PIER.
shewing position of intended Flying Buttress.
Aisle Wall Buttresses
C.E.P.

FIG. 305.—York Nave.
Isometric Diagram of Structure.

the nave, a cross or ribbed vault, with concentrated thrusts occurring at certain defined points, to wit, over the piers supporting each bay, it is clear that the abutment of the side half-barrels is only required at those points. Omit, then, all the intervening and unnecessary portions of the side vault, and the sections of it which remain are flying buttresses hidden beneath the external roof of the triforium, as at Durham.

Protected and concealed abutment arranged on these lines was the method which the English builders preferred and adopted whenever possible, thus steadying the clear-story wall, and associating the aisle wall and buttress in resisting the thrusts of the high vault.

Such is the buttress system of Wells' nave (*c.* 1170) (Fig. 75, page 116),—with the addition of a stout clear-story buttress,—and Salisbury, for example. (Fig. 8, page 19.)

Exposed Abutment.—But with a more completely elaborated scheme of construction evolved on Gothic lines, with lighter walls and a higher set vault, other dispositions were necessary, as in France.

At Canterbury choir, 1175—1178, and Lincoln choir (*c.* 1192—1200), Figs. 115 and 116, the flying buttress is no longer hidden but appears above the roof.

Timid and distrustful of its functional capabilities, the builders, however, reinforced the construction by providing, in addition, a transverse arch, built across the triforium as before.

In both these examples the actual flying buttresses are slender; but at Chichester, in the construction of the new vaulting, after the fire of 1186, we find a much sturdier version of the Lincoln abutment scheme. The buttresses are doubled, one above and one below the triforium roof—an approximation to French methods, though clumsy in its execution.

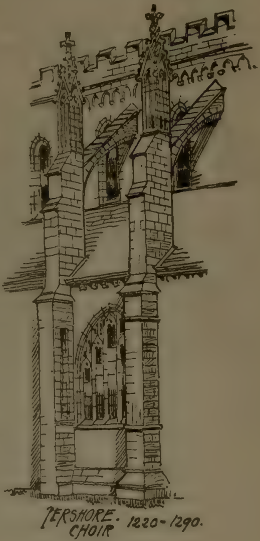

PERSHORE. CHOIR 1220-1290.

FIG. 306.

The pinnacle was introduced at New Shoreham to weight the flying buttress; but this was omitted at Boxgrove (*c.* 1230), where, however, the builders have again boldly placed the flying buttress above the roof, relying on it alone to resist the thrusts.

The arch curvature of these early flying buttresses approaches a quadrant of a circle—an unsatisfactory arrangement which exercised an unnecessary pressure against the clearstory wall, often aggravated by the massive structure of the raking buttress, the inclination of which was not always disposed at the best angle.

It is then sloped upwards more acutely, as at Pershore, and the supporting arch flattened in curvature to obviate buckling; then the structure becomes less massive, as at Exeter (Figs. 197, 212), Ely, and Malmesbury.

With the increased accession of height at Westminster Abbey (Fig. 175, page 219), comes the introduction of the Continental method of the flying buttress in two tiers, and in order to bridge over the cloister the spans on that side are also doubled, but this is an exceptional example.

To decide the exact point where the vault thrusts act, usually somewhere between the springing and half-way up, is not an easy matter. So by tilting up the arch and raker, and thus enlarging the spandrel-piece between, the head of the flying buttress was enabled to get a good grip of the clear-story wall at the back of the vault-springing.

For this same reason, and in order to carry the water away from the gutters of the high roof, the French either superimposed their flying buttresses in tiers, or increased the height of them by raising the inclined stone bar (forming the coping and inclined gutter), upon a pierced arcade resting on the arch, as at Amiens. (Fig. 268, page 347 ; Plate, page 459.)

Again, to prevent any tendency of the flying buttress to buckle under the stress of the vault thrusts, the French masons, in the XVth century, sometimes constructed the top raking bar with a reversed curve.

This French system of taking away the water from the gutters of the high roofs by means of these channels carried by the flying buttresses, and then discharging through gargoyles away from the main building, was not so necessary in England, owing to our buildings being lower.

We were often content to provide parapets and gutters, and to generally, at the higher level, let the water discharge through gargoyles or spouts on to the lower roofs of the aisles, and thence be led away.

During the XIVth century, concurrently with the development of pinnacle design, comes the tendency to pierce the spandrel-piece at the head of the flying buttress, as at Wells presbytery, carried further in the XVth century at Sherborne (Fig. 307), and later still at Bath Abbey (Fig. 247, page 313).

At Henry VIIth's Chapel, Westminster, ornate buttresses are provided, superimposed, and connected together with a spandrel-piece of pierced tracery.

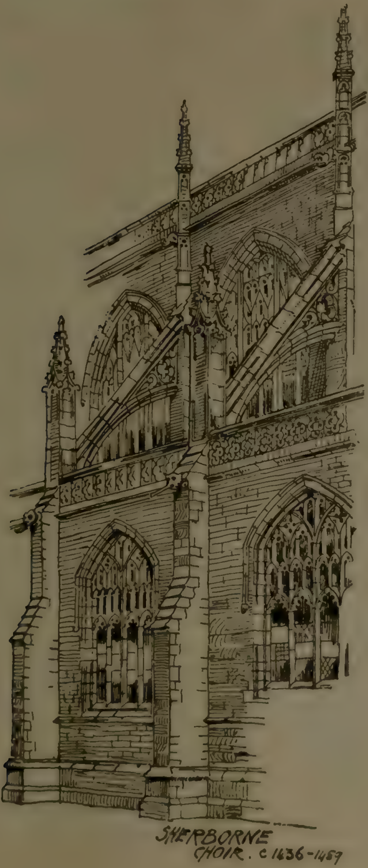


FIG. 307.

By the manner in which the head of the English flying buttress usually abuts against the clear-story wall, we see an emphatic expression of the difference between our insular methods and Continental practice, and show how deeply rooted the Benedictine tradition of *wall structure and support* was in England.

The flying buttress normally just stops against the wall, as at New Shoreham, Pershore, and Bath. At Lincoln nave the flying buttress dives beneath the wall-arcade, and seems to pierce the wall, a most illogical arrangement. The flat projecting pilaster strips, such as of Boxgrove or Malmesbury and elsewhere, can hardly be regarded as being of serious constructional import, any more than the decorative character of the pinnacles and buttresses, though more strongly marked, of Wells presbytery, Lichfield, and Sherborne, can be taken as adequately representing the functional expression of the French vault pier. (Plate, page 375.)

Only rarely do we meet anything approaching this method in scientific arrangement.

To summarise, the English builders showed their distrust of the exposed flying buttress by adopting protected abutments wherever possible, achieving this object by either keeping the vault low, acutely pointing the diagonal arches, and in the cases where a later vault was put over a Romanesque central nave, as at Gloucester nave, Tewkesbury nave, or Oxford choir, relying on the massiveness of the wall structure to adequately abut the thrust. Often these and other expedients are used in combination.

At Gloucester choir, Fig. 228, page 281, the combination of lofty pointed barrel vault and lierne vault is abutted by *clear-story wall buttresses* and the earlier vaults of the triforium.

At the Temple Church, in the XIIIth century, and at Bristol choir, in the XIVth century (Figs. 145, 198), another system of internal and protected abutment was devised. The clear-story was dispensed with and the side aisles raised to equal height with the central nave, an arrangement much in favour in German Gothic, giving the type known as the Hall Church; such are St. Stephen's, Vienna, or St. Elizabeth, Marburg.

The thrusts of the vaults of nave and side aisles are thus placed *in opposition*, annulling each other, and the flying buttress is unnecessary; an application of the principle noted on page 6, and shown in diagram form in Fig. IX, page 3.

(Compare also the earlier Romanesque arrangement of parallel barrel vaults, as in St. John's Chapel, Tower of London (XIth century).)

But when and where the English builders conquered their dislike of the exposed abutment, they showed how skilful was their handling of it; but from the reasons indicated above, they were never under the obligation to employ it on the vast scale of Continental practice, and so the system is less highly developed.

Wall Buttress.—The evolutionary aspect of the wall buttress may be briefly summed up thus:—

For the reasons we noted above the early buttress rises sheer from base to summit, and those of the Romanesque, Transitional, and XIIIth century are distinguishable from each other by the gradual increase of projection and relative proportion of width to depth. (Compare Fountains, Jervaulx (Fig. 260).)

Romanesque buttresses, if of slight saliency, simply run up and die beneath the corbel table which they help to support, *e. g.*, Adel, Fountains (Fig. 302), or terminate in a slope or weathered *set-off* just below the parapet or eaves. (Lastingham (Fig. 61), Hampton in Arden (Fig. 73).)

They are never gabled as are those of Gothic.

The angles may be enriched with nook shafts (Fig. 302), a method of decoration still in vogue during the XIIIth century, but more usually at this later period, the buttress faces are arcaded in important buildings, *e. g.*, Ely east front, Wells, Lincoln (Fig. 161), or the angles may be widely splayed, *e. g.*, Bridlington (Fig. 172).

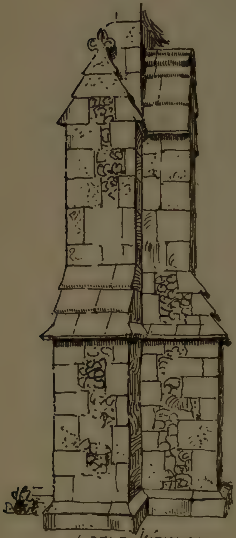


FIG. 308.

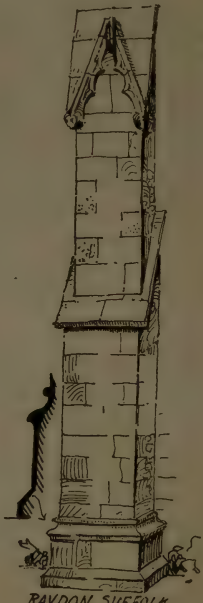


FIG. 309.

During the Lancet period the gablet (acutely pitched) comes into use as a terminal as well as the plain sloped set-off, and the abutment pier begins to rise above the level of the parapet, *e.g.*, Lincoln, Southwell. At the same time, the buttress with the material set back in stages appears; these are usually two in number. (Figs. 136, 308.)

Geometrical buttresses are sturdy, massive, and rather simple, though rich examples may be arcaded. Henceforth three stages become a common arrangement; the gablets are flatter in pitch; about the beginning of the XIVth century the slope of the set-off is often continued obliquely up along the side of the buttress, dying out against the wall. (Raydon, Suffolk, Fig. 309.) The pinnacle now comes into general use as the crowning feature of the buttress when it rises above the parapet.

The buttresses of the XIVth century are notable for their restrained elaboration and the development of the base courses, the spread of which becomes notable during the latter part of the XIIIth century.

In the XIVth, XVth, and early-XVIth centuries, often a deep and ornate plinth runs continuously along the base of both wall and buttress, *e.g.*, Selby (Fig. 194), Holbeach (Fig. 311).

Niches are recessed in the faces of the buttresses, with ogee heads and canopies flanked by miniature pinnacles (Carlisle, east front; York, west front); and in place of two buttresses set at right angles to each at the corner of a building (Fig. 308), one diagonal buttress is often substituted. (Figs. 209, Houghton-le-Dale; 213, Colchester, All Saints.)

The gablets may be straight-sided or of ogee outline, and are enriched with crockets and finials.

Pinnacles become more elaborate, and instead of the spirelet sloping upwards, pyramid fashion, from a level cornice line, Westminster (Fig. 175), Exeter (Fig. 212), they rise from behind a group of gablets ranged around at its base. Selby (Figs. 194, 195), **York** (Fig. 305).

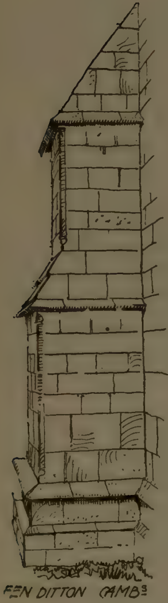


FIG. 310.

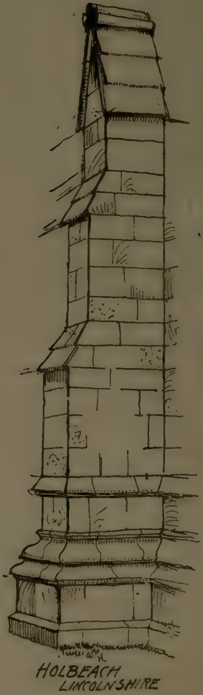


FIG. 311.

Perpendicular buttresses are narrower and deeper in relative proportion and projection, as compared with those of the preceding periods: a marked tendency for the number of *stages* to increase is also notable.

In rich buildings they are elaborately panelled, niched, carved and pinnacled (Yelvertoft, Northants.; Beauchamp Chapel, Warwick; the west fronts of Bridlington and Beverley, etc.); and though the straight, plain slope is rather more commonly employed for the set-off between the receding buttress stages in place of the triangular head, elongated ogee and concave curves are often used for the outline of the gablet, *e.g.*, Bath Abbey (Fig. 247), Ripon nave.

Sometimes the faces of the top part of the buttress are set diagonally, rising upwards into the pinnacle, *e.g.*, porch, Beverley, St. Mary's; tower, Taunton, St. Mary's. During the Tudor period the spirelet of the pinnacle often assumes a curved, ogee form, as at Winchester, Henry the Seventh's Chapel, Westminster, etc., in place of the straight outline of earlier use, while figures, angels, heraldic beasts, may take its place as a terminal, *e.g.*, the Notyngham porch, St. Mary's, Bury St. Edmunds; Ardleigh (Fig. 227).

CHAPTER XV.

Pier Construction.

In reference to this we will note the meaning of the following technical expressions:—

Pier.—The term is used here as relating, primarily, to the masses of masonry supporting the arches.

Column.—An isolated cylindrical support of classic form and proportion. (Fig. 312, A, B.)

Cylindrical Pier.—One of circular section on plan. (Figs. 63, 119, 120.)

Shaft.—A long and thin support of circular section. (Fig. 137.)

Engaged Column.—A stout shaft bonded to, or forming part of, and projecting from, the mass of a pier or wall. (Fig. 312, F.)

Engaged Shaft.—Partly attached to the masonry of a wall or pier.

Shafts and Columns are either independent and detached, or engaged, *i. e.*, built up with, and forming part of, and projecting from, the face of adjacent masonry. (Compare Figs. 111, 121, 165, 184, 185.)

Pilaster.—A flat rectangular projection whose breadth is greater than its depth. In Classic and Renaissance architecture it is usually enriched with a cap and base. (Fig. 312, D, E, G.)

Origin of the Compound Pier.—The Classic column, as originally purposed, was adequate as a means of vertical support to the lintels or arches bearing the simple structure of the Pagan temple or early Christian basilica. It was, however, far too slender to carry any great weight, and was succeeded later by a rectangular pier of masonry, when and where a supply of columns was not available, as we have seen.

With the addition of transverse arches spanning the central nave from side to side, as in the VIth-century Syrian church at Roueiha, and in the XIIth-century alterations to the earlier IXth-century basilica of St. Prassede, Rome, other dispositions became requisite; in the latter example every third column was encased in an oblong pier, placed with its longer axis transversely.

The evolution of the plain rectangular pier into the *compound* pier took place briefly thus:—Suppose, then, that it is desirable to span the central nave of an aisled structure with transverse arches carrying a diaphragm wall above, with a view to reinforce the clear-story wall, perhaps to help support the roof purlins, and, may be, an attempt at preventing the spread of fire.

To provide support for such an arch, an additional pier or projecting pilaster is provided to carry the transverse arch and the original rectangular pier becomes T-shaped in plan. Such is the disposition at Roueiha. (Fig. 312, C, D.)

Next, it is desirable to provide abutment to the central diaphragm arch by continuing the arcade arches across the aisles. Another projection is added at the back of the main pier, and the whole mass in plan becomes cross-shaped. This is the principle of the system at St. Miniato, Florence. (Fig. 312, E, F.)

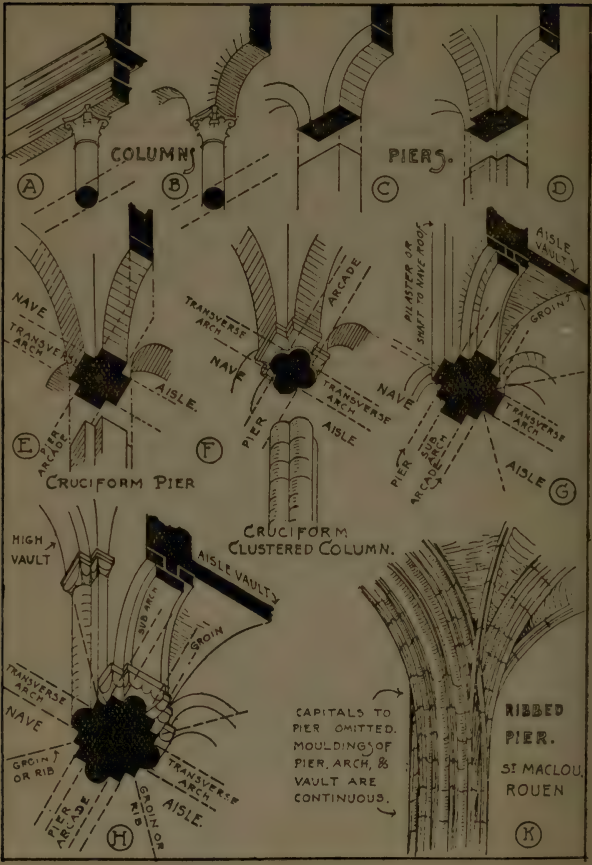


FIG. 312.—Pier Evolution.

We have, then, a double series of arches crossing each other at right angles, thus determining the plan-form of their common support.

Again, if the nave arcades are constructed in "orders," other projections as support are required and added. So around the original nucleus of the wall pier are assembled other projections, as pilasters or shafts, bonded to and forming part of the central mass. (See Ely Nave, Fig. 55.)

As the structure of the building becomes more complex, in place of the diaphragm walls, transverse arches, and wood roof, a barrel vault may be substituted over nave or aisles, or over both, as we have before noted; the points of support already furnished doing duty for the transverse arches of the vault. (Fig. 312, G.)

Furthermore, the introduction of a groined vault instead of a barrel does not alter or affect the general disposition; and again, the substitution of a ribbed vault in place of this only necessitates the provision of additional projections to receive the increasing and complex articulation of the structure. (Fig. 312, H.) (See Durham Nave, Fig. 266.)

So the main body of the pier then tends to become concealed by the array of shafts around it. (Fig. 76.)

The complexity of the Compound Pier.—The principle of the *compound pier* was thus elaborated during the Romanesque period; in Gothic times attention was rather directed to simplifying its intricacy; and progress was shown in the elimination of the superfluous, compacting of parts, and lightening of structure.

Because of its very elaboration, the strictly logical correlation of superstructure and supports was often almost impossible to carry out.

There was no space around the slender Gothic pier to mass the panoply of shafts which logic demanded and Romanesque bulk rendered possible, unless the shaftings became, as they did in some late examples, little more than overgrown mouldings. (Compare the sectional area of the piers of Durham, *c.* 1093, with those of Westminster, *c.* 1250, Fig. 76.)

The articulation of structure and multiplication of functional expression of parts, if logically followed out, almost resulted in absurdity beyond certain limits. Its redundance resulted in decorative confusion.

For note how that, in place of the single early Romanesque wall shaft ascending to the transverse arch of the barrel vault or wood ceiling, logic demanded with a groined vault the provision of two additional shafts to support the arrises of groin, and later the ribs, as at Durham or St. Ambrogio, Milan.

With a further increase of two shafts for the wall ribs, a group of five shafts in all rises in front of the main pier.

Likewise as to the aisle vault and the orders of the nave arcade, each arch demanded its own special support.

This additional projection of the group of vault shafts beyond the main face of pier tended to narrow the nave, encumber the floor space, render the pier bulky, and obstruct the view; so that, though extremely valuable as was the strongly-defined vertical line marking the bay divisions, the shafts were often stopped at the level of the abacus of the pier or corbelled out above it.

The Cylindrical Pier.—Realizing thus the complexity of the scheme of pier design which they had evolved, and hoping to simplify it, fleeing from its bewildering and imperious logic, as an alternative, the plain cylindrical pier was largely used by the XIIth-century builders.

The entire paraphernalia of arch orders, vault ribs and shafts, rests on its abacus, as at Peterborough. (Fig. 78.) Sometimes a polygon is substituted for the cylinder.

We meet the cylinder at Gloucester and Tewkesbury naves, used on a colossal scale in the XIth century; at Peterborough, St. Bartholomew's, Smithfield, Waltham and Southwell, in the XIIth century, to cite only a few Romanesque examples. (Fig. 63.)

During the Transitional period it is employed at Buildwas and Malmesbury; lightened in bulk and proportion, it formed the basis of the traditional type of support in buildings of lesser importance, such as parish churches, where a more elaborate pier was not required. (Fig. 313.)

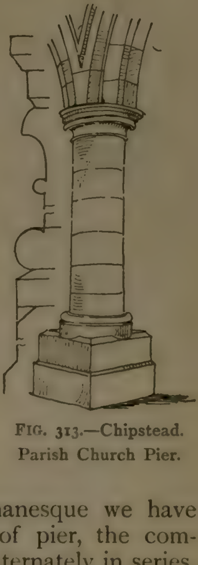


FIG. 313.—Chipstead. Parish Church Pier.

Gothic Piers.—So that in Romanesque we have the concurrent use of two types of pier, the compound and cylindrical, often used alternately in series. (Figs. 115, 266.)

This latter became also a favourite type of Early Gothic pier in France, as at Notre Dame, Paris.

Then, as at Rheims, Amiens, Salisbury, Westminster, and elsewhere, this is further developed as a circular pier with four colonettes or shafts placed to the cardinal points; to be followed again by a return to the structural expression of articulated support in the complex serried shaftings to arches and vault of the later Gothic on the Continent.

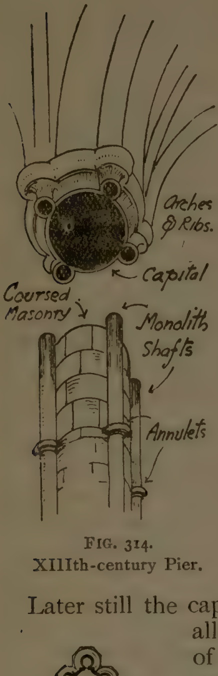


FIG. 314.
XIIIth-century Pier.

From the constructional standpoint, the shafts and the capitals may be at first regarded as being jointly the members of support to the vault and superstructure. (Fig. 314.) Then, on the disuse of monolith shafting, the capital alone, in its aspect as a corbel, supported the vault pier.

The employment of *tas-de-charge* supersedes the capital as supporting member; the latter surviving solely by reason of its purely decorative use in facilitating the modification of profile between the ribs above and the shafts below. This also applies generally to the relation between piers, shafts, arches, and capitals.

Later still the capital is eliminated as being logically unnecessary, and the profile of the pier is determined by the aggregation of the ribs and arch-moulds it supports, which descend, often in unbroken sequence, to the ground, as at Orleans or St. Maclou, Rouen, with occasionally a sparing use of shafts. We may term this the "*Ribbed Pier.*" (Fig. 312, K.)

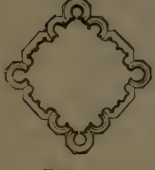


FIG. 315.
Perpendicular Pier.
Canterbury Nave.

Such in the main is the *rationale* of the design of piers, such as those of Gloucester choir, St. George's, Windsor, and Henry VIIth's Chapel, Westminster.

An alternative method favoured in late Continental Gothic is to allow the ribs and arches to die away, impaled, as it were, on the plain cylindrical shaft, the springing courses of the arches rendering the capital structurally unnecessary.

"*Tas-de-Charge.*"—When, for example, an isolated pier—of, say a nave arcade—supported the springing of two or more closely-set arches, with a wall or a pier set between, heavily loaded with the superincumbent weight of triforium, clear-story and roof, with perhaps often a vault, it was found that the construction shown in diagram form, in Figs. (1) and (3), page 398, was faulty.

The load, acting on the triangular spandrel-piece at the base of wall or pier, contained between the extrados of the side arches, tended to crush the material in the lower part, and to put a cross strain on the arch haunches.

The widening of the abacus, as in Fig. (2), was not an entirely satisfactory solution of the difficulty, neither was it always practicable.

In order to give a direct and adequate *horizontal* bearing to the central load as well as to the adjoining arches, various expedients were tried.

Ultimately, the lower arch stones or springers were built in *horizontal courses*, instead of with *radiating* joints, up to such a point as gave an adequate bearing both to arches and to wall or pier load, at *right angles* to their respective thrusts, as shown in Fig. (4), page 398. Or take another example, say the central and isolated pier of a polygonal chapter-house, or the isolated piers sustaining the vault of Wells retrochoir. The same problem appears in a different form, but the solution was the same. (Plate, page 145.)

In other words, the pier was continued up *above the springing line of the arches.* This construction is called, technically, "*tas-de-charge.*" (Fig. 139.)

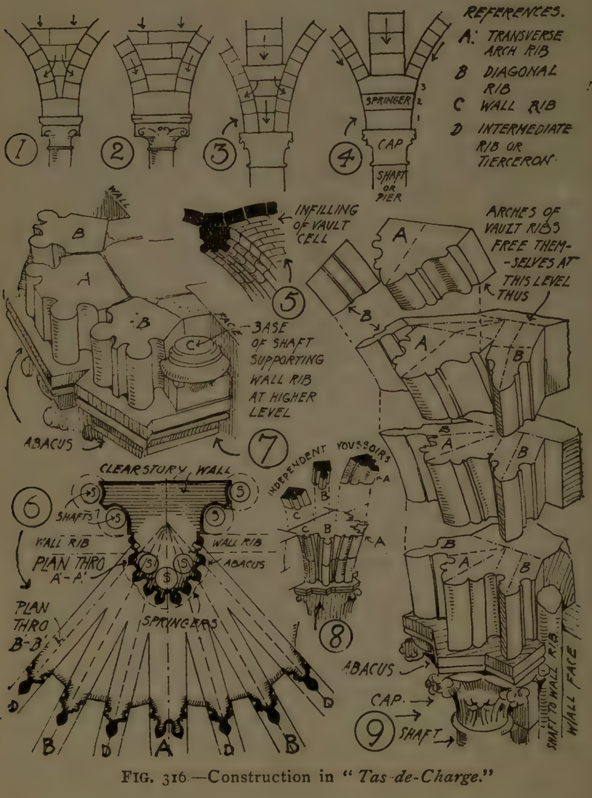


FIG. 316.—Construction in "*Tas-de-Charge.*"

This method made for enhanced rigidity, compactness, and efficiency, and was most useful in the construction of vaults where groups of ribs converged downwards on to the abacus of the vaulting shaft.

When independent ribs were first introduced, each separate complete arch rested directly thus, and was entirely constructed with radiating joints. This involved arranging as many springers as there were ribs, in the very restricted area of the abacus.

In Fig. (7), page 398, three such springers, of one transverse and two diagonal ribs, are shown; the shafts at the sides ascend higher still, to receive the wall ribs, which are thus stilted in this example.

Moreover, the said ribs were rectangular in form, broad on the face and shallow as to depth, and, as will be seen from the diagram, occupied some space and were awkward to arrange. (Fig. 290.)

Now, especially in a light arch, it is the depth from intrados to extrados of the voussoirs composing it which is of primary import in determining its strength.

The breadth counts as supplying transverse stiffness.

Obviously, in a ribbed vault, the weight-carrying properties and resistance to buckling were of principal importance, for the requisite lateral rigidity was provided by the abutment of the cells of infilling adjacent. (Figs. 275, 276.)

Therefore, to obtain the maximum efficiency, the rectangular arch stones were re-arranged, with their narrow face as soffit, and moulded on a triangular basis, as in Fig. (9), page 398.

Instead of the assemblage of independent voussoirs, as in Fig. (7), a common springer serves for each group of converging ribs, as in Figs. (8) and (9), page 398. (Compare also Fig. 140.)

This enabled the ribs to be set closer together at the springing, and brought down so as to *inter-penetrate*, as in Figs. (8) and (9), page 398, the springers being built in *tas-de-charge* or horizontal courses, up to the level at which the various ribs freed themselves, when they were constructed as independent arches with radiating joints. Thus the clear span of the various arches was reduced and a corresponding economy in centering effected.

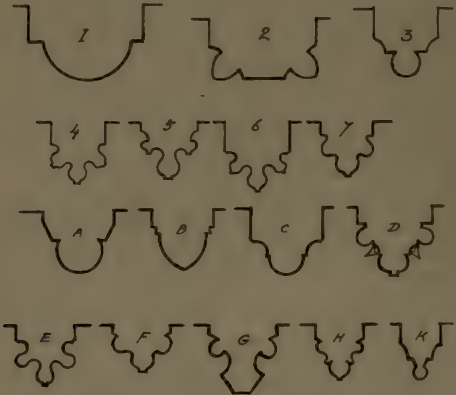


FIG. 317.—Profiles of Vault Ribs.

The *triangular* or ridge-like arrangement of profile was adopted, because it allowed the centre moulding of each rib to descend in unbroken sweep on to the cap of the vault shaft, and so enabled a complicated group of ribs to spring up in a sheaf, and yet each one to remain perfectly distinct, as at Ely. (Fig. (6), page 398.)

In this example it will be noted that the transverse arch is broader than the others; an interesting survival of the use of the broad transverse arch introduced to act as permanent centering, and to stiffen the web of the Romanesque barrel or groined vault, as noted on an earlier page. (Figs. 62, 71.)

In a ribbed vault this was logically unnecessary, and the transverse arch is usually of similar section and size to the other ribs.

Construction in *tas-de-charge* appears in England toward the end of the XIIth century, and in France at the beginning of the XIIIth century.

The Vault Pier.—The pier in its first introduction was a support to the arcade and the wall over, and we have seen how the use of *tas-de-charge* construction was productive of an extension upwards of its functional structure.

What was done at the level of the nave arcade was equally applicable at the level of the triforium, and especially at the clear-story levels of the springing of the high vault.

By thus eliminating the wall and substituting open arcades and windows, we obtain the vault pier.

FIG. 317.—Vault Ribs.

REFERENCES :—

Transverse ribs only—

1. Kirkstall nave aisle.
2. Roche aisle.

Diagonal ribs only—

A. Kirkstall nave aisle.
B. Furness nave aisle.
C. Roche aisle.

Transverse and diagonal ribs uniform—

3. Byland aisles.
4. Hexham choir aisle.
5. Fountains choir aisle.
6. Guisborough choir and aisles.
7. Selby choir and aisles.

D. Canterbury.
E. Whitby choir aisle.
F. Bridlington nave aisle.
G. Tintern nave and choir.
H. Howden choir and aisles.
K. Colchester abbey gate.

Romanesque attempts at this ideal are seen in the storied arcades of pier and triforium at Waltham and Southwell in an elementary and crude form.

So in French practice, the pier ascends in unbroken height up to the top of the clear-story.

Such, in brief, was the evolution of the *vault pier*, kept in position and stayed by the thrusts of the adjacent arches, flying buttress, and the vault it supported. (Fig. 268.)

Without such a scheme of skeleton construction and elimination of wall, with its concomitant reduction of weight and economy of material, the attenuated and lofty proportion of the French churches would have been almost unattainable. (Plate, page 375.)

English Gothic Pier Design.—But in England we clearly show how deeply ingrained and enduring was the Romanesque tradition of *wall* support, expressed by our treatment of the vault springing and vaulting shafts in the naves of Wells, Salisbury, and Exeter, for example. (Figs. 8, 75, 206.)

These shafts rarely descend to the ground, as at Durham, St. Saviour's, Southwark, or York Minster. The general practice is to support them on a *wall* corbel, as at Ely and Lincoln presbyteries. (Figs. 163, 181.)

From this reason the English mason, compromising between the relentless logic of the compound pier and the simple directness of the severe cylindrical support, found himself free to usually treat the shaft groupings of his pier solely in relation to the "orders" of the nave arcades and the aisle vault, regarded rather from the decorative than from the strictly constructional standpoint.

Three archetypes of pier design may be marked out as distinctive of the practice of the three schools of influence—the *Western*, *South-Eastern*, and *Northern* —which shaped the course of English Gothic.

The *Western Pier* is short and sturdy, built up in coursed work, its tendency to Romanesque bulkiness of proportion masked by the closely-ranged grouping of engaged shafts set in *triplets* around its circumference, as at Wells (*c.* 1170). The transition from Romanesque is seen earlier at Worcester. This type of pier goes generally out of use at the end of the XIIth century. (Fig. 121.)

The *South-Eastern Pier*, so typical of our XIIIth-century work, consists of a central core, usually a cylinder built up in courses of stone set around with 4, 8 or more independent monolith shafts, usually of marble; as at Chichester, Salisbury, Lincoln, Westminster, &c. (See Figs. 121, 141.)

The use of detached dark marble shafting appears at first at Canterbury, and its employment lasts throughout the Early English period, the practice finally dying out *c.* 1300.

It was lavishly employed, not only in piers, but in vaulting shafts, arcades, and jambs of openings.

This type of pier spread rapidly far and wide, superseding the western pier at Wells and Worcester, for example; and northwards we meet it at Ely, Peterborough, and Lincoln; and also in the east transepts of Durham and Fountains. A variant of this type is the use of single, coupled, or grouped marble shafts, as at Canterbury, Salisbury, and Durham.

The introduction of monolith shafting was, in its primary inception, a constructive device to strut or stiffen the coursed masonry pier, and was largely and scientifically used in France. (Fig. 314.)

The main body of the pier was built up, allowed to take its bearing properly, and then the shafts were placed in position the last thing. The monoliths are joined to the main body of the pier by stone bands or *annulets*, or metal cramps.

The disuse of marble shafting came about because the surface became disintegrated, and then the shafts, after the XIIIth century, return to the earlier Romanesque method, and are built up in courses with the rest of the pier or wall and become ultimately merely decorative.

The *Northern Pier* (Figs. 121, 141, 256), however, survived its vigorous contemporaries. Its form is that of a group of *clustered engaged columns*, in number usually about eight, and often in early work of pointed section, and after the disappearance of the South-Eastern Pier, forms the basis of most of the subsequent work. By its simplification to four stout columns, set around with four lesser marble shafts, we obtain a form which combines the Northern and South-Eastern Piers, and which in turn, by various modifications, became typical of many XIVth-century piers in the lesser parochial buildings.

Parish Church Piers and their evolution.—Owing to the less highly organised and articulated quality of the average Parish Church building, pier design in this class of structure is much more simple; the pier supported the arches and wall above, which latter in turn carried the roof.

Reduced to their simplest elements, we may classify the archetypes as (A) rectangular, (B) cylindrical, (C) cruciform, (D) diamond, (E) octagonal or polygonal. (Figs. 319, 391.)

(A) *Rectangular piers.*—These are usually met with in Romanesque and simple Transitional building. In the XIIth century at St. Nicholas-at-Wade, Thanet, oblong masses of wall form piers terminating in engaged half-columns, while at St. Margaret's-at-Cliffe, Kent, is seen development towards a cruciform plan. (Fig. (8), page 406.)

(B) *Cylindrical piers.*—The simple cylindrical pier early begins to develop engaged shafts; sometimes these are set on the diagonal axes, as at Islip, Oxfordshire, *c.* 1180 (Fig. 318), or Whaplode, Lincs.; at Moulton, Lincs., *c.* 1175, these shafts are set on the cardinal axes (c^1 c^1, c^1 c^1). (Fig. (1), page 406.) (Compare also Peterborough, Fig. 76.) At St. Sepulchre's, Northampton, *c.* 1175, is seen a lighter version of this arrangement. Later on these shafts become slender detached monoliths, as at Weston (Fig. (3) or West Walton, for example. Dorchester, Oxfordshire, *c.* 1300 (Fig. (4), page 407), and Ashbourne, Derbyshire, show us the return of the engaged shaft.

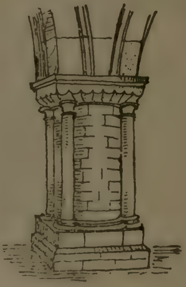


FIG. 318.—Islip. Oxfordshire, *c.* 1180.

(Compare the foregoing with Navenby, *c.* 1180, Fig. (24); Grantham, Fig. (18); and the polygonal examples from Furness, Figs. (31), (38), St. Peter-at-Gowts, Fig. (39), and Waddington, *c.* 1190, Fig. (32); on pages 406, 407.)

(C) *Cruciform piers.*—There are many sub-varieties of this type:—

(1) A cluster of four stout *semicircular* shafts, as at St. Peter's, Northampton, mid-XIIth century (Fig. (15), page 406); these become more

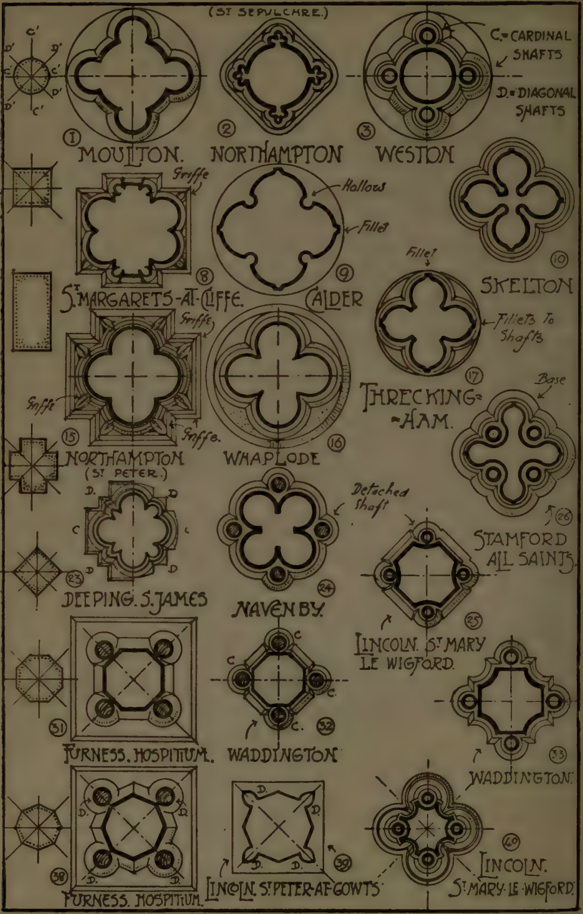


FIG. 319.—Parish Church Piers.

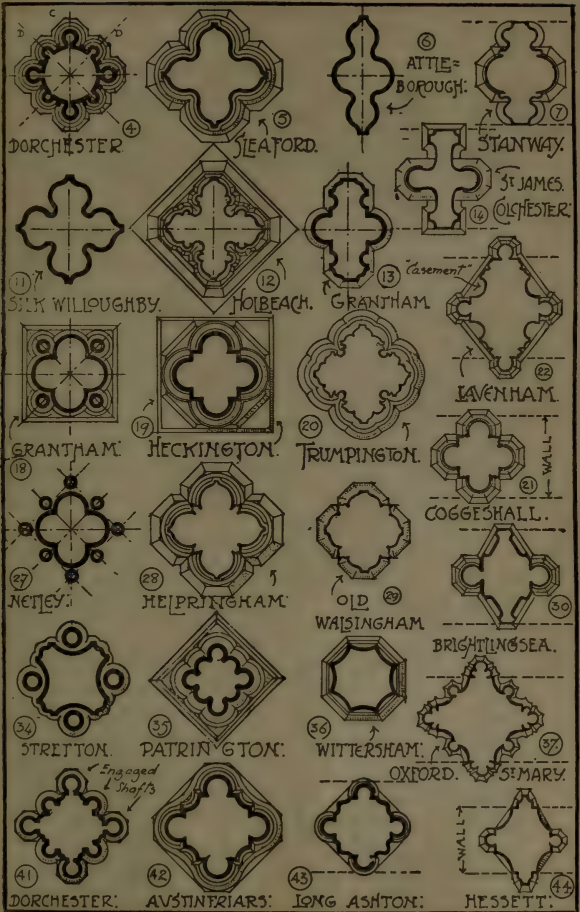


FIG. 320.—Parish Church Piers

slender in mass during the XIIIth century, and are often filleted.

(2) Derivative from the preceding class (c^1), —cruciform, with *three-quarter* shafts, showing greater projection and with an *incised angle* in between, as at Whaplode, *c.* 1175 (Fig. (16), or Market Deeping; at Threckingham, Lincs. (Fig. (17), page 406), these are filleted.

(3) Derivative from class (2) preceding, but with a *hollow* lying between the four clustered shafts, *e.g.*, Calder, XIIth century (Fig. (9), page 406). This hollow may be narrow and deeply undercut, *e.g.*, Skelton, Yorks., *c.* 1227-47 (Fig. (10), but is wider and more open, as for example at Higham Ferrers, Finedon, Northants.; Sleaford, Lincs. (Fig. (5), page 407), *c.* 1325; thus the component shafts become less closely compacted and the plan form loose and sinuous in outline, *e.g.*, Silk Willoughby, *c.* 1300 (Fig. (11), page 407), whence it is an easy transition to an arrangement such as at Attleborough, Norfolk, in the XIVth century (Fig. (6), or Stanway, Essex, of XVth-century date. (Fig. (7), page 407.)

(4) Clustered cruciform with *diagonal angle shafts.* This type, of the "Northern Pier" class, may also have been evolved from the early cylindrical pier with diagonal shafts, *e.g.*, Islip. (Fig. 318.) (Compare Grantham, Fig. (18), page 407.) In Transitional work we meet this combination at Deeping St. James, *c.* 1170 (Fig. (23), page 406); Little Dunmow Priory; Barnack, Northants., *c.* 1185, for example. Later, in the XIVth century, it is employed at Rougham, Suffolk, and in Perpendicular

times at Long Melford, Suffolk, *c.* 1481, and (slightly modified) at Coggeshall, Essex (Fig. (21), page 407), *c.* 1404–26.

In XIIIth-century work the shafts stand free, as at Grantham, Lincs. (Fig. (18), page 407), while the example given from Netley Abbey shows how, by the addition of both cardinal and diagonal shafts, the cruciform plan evolves into a diamond outline (class D, see below).

Sometimes the shafts are set deep within the angle hollows of class C^3, as at Stamford All Saints, *c.* 1220 (Fig. (26), page 406), or Stone Church, Kent, *c.* 1251–74. In Decorated work the diagonal shafts become engaged once more, and the cardinal shafts become broad and undulating, the pier plan assuming the form of a group of four large and four small filleted ogee-shaped rolls, *e.g.*, Old Walsingham, Norfolk (Fig. (29), page 407); Helpringham, Lincs., *c.* 1320 (Fig. (28), page 407); Leadenham, Lincs.; Little Addington, Northants., *c.* 1320.

(D) *Piers based on a diamond plan form.*—In these a square is set with its faces set diagonally with shafts grouped around. This type would seem to have been suggested by the gradual evolution of, and the addition of shafting to, the cylindrical cruciform, or polygonal plan forms. (Compare Figs. (3), (24), (25), page 406; and Figs. (27,) (34), (35), page 407.) But in the greater buildings, piers set out on a diamond plan are met with in Lincoln choir and Pershore (Fig. 147), and elsewhere.

In Lancet work we find piers such as Waddington, *c.* 1190 (Figs. (32), (33), page 406); and Lincoln, St. Mary-le-Wigford (Fig. (25), page 406), with a central octagonal pier mass, against which are set free standing monolith shafts. At Dorchester, *c.* 1300 (Fig. (41), page 407), these shafts are incorporated in the pier mass, and at Patrington, XIVth century (Fig. (35), page 407), set closely together along the canted sides. (Compare the piers of Exeter, Guisborough, and Bridlington (Fig. 141). Long Ashton, *c.* 1400-3 (Fig. (43), with a wave mould substituted for a shaft, and Oxford, St. Mary (Fig. (37), give us Perpendicular paraphrases of the earlier XIVth-century arrangement; while the survival of its influence may be traced in the elongated forms of Lavenham (Fig. (22), Brightlingsea (Fig. (30), and Hessett (Fig. (44), page 407).

The increasing emphasis of the diamond plan during the XIIIth century may be traced in evolutionary development by the increasing accent of the cardinal shafts of some cruciform piers. (Compare the examples from St. Peter's, Northampton; Whaplode, Skelton, Threckingham, Silk Willoughby, Holbeach; pages 406, 407.)

(E) *Octagonal and Polygonal piers: and their derivatives.*—These show a parallel development to the circular and *radial* plan forms. Furness and St. Peter-at-Gowts furnish us with examples of the use of diagonal shafts, retaining the primal rectangularity of Romanesque abacus and base.

The addition of cardinal shafts, as at Waddington, *c.* 1190 (Figs. (32), (33), page 406), at once foreshadows the evolution of the diamond plan (compare St. Albans, Fig. 141), and the later elongation to be achieved in Perpendicular. Sometimes the faces of the octagon are hollowed out and the shafts set within, detached as at St. Mary-le-Wigford, *c.* 1230 (Fig. (40), page 406), or engaged as at Eaton Bray: both XIIIth-century examples.

Or the diagonal faces alone may be hollowed, *e.g.*, Waddington (Fig. (33), page 406.) With stout engaged shafts in place of detached ones, we obtain the pier form of the Austin Friars' Church, London, *c.* 1354 (Fig. (42), page 407), which becomes a recurrent type in Perpendicular, *e.g.*, Lindfield, Arundel, Beddington, etc.; or modified in still more characteristic fashion according to XVth-century ideals, as at Hessett. (Fig. (44), page 407.)

Summary.—Cylindrical, polygonal, and simple cruciform piers, are common to all periods in "parochial" work; the distinctive criteria of date must be sought in the profiles of cap and base, character of carving, and ornament.

"Anglo-Norman" piers are simple, massively rectangular, cylindrical, *e.g.*, Steyning; polygonal or cruciform, *e.g.*, Clee, Polstead. (See Fig. 391.)

"Transitional" piers are lighter, clustered columnar in type of the "Northern" pattern, the shafts being sometimes "pointed bowtells." (See page 463 and Figs. 121, 374, and Deeping St. James (Fig. (23); St. Peter-at-Gowts (Fig. (39), page 406.)

In "Lancet" the central core mass of the pier of "Southern" type is independent and prominent, though not so predominant as in Romanesque, and surrounded with circumjacent shafts set out on a *radial* plan form (see Figs. (3), (24), (25), (32), (33), (40), page 406); though the "clustered" type is often employed. (Figs. (10), (17), page 406.) Stone and Stamford (Fig. (26), page 406), present us with a combination of Northern and Southern ideals.

During the "Geometrical" period the shafts often become stouter in proportion, and now coalesce with the central pier mass, while the emphasis given to the cardinal shafts, coupled with the flattening of the canted diagonal faces of the pier, evolve the diamond-shaped plan, a favourite "Decorated" form, as at Patrington. (Fig. (35), page 407.)

But the two most common XIVth-century types are—(1) Heckington (Fig. (19), page 407), a central square mass, the angles of which alone jut out between four semicircular engaged shafts; and (2) clustered piers, such as Silk Willoughby (Fig. (11); Finedon; Helpringham (Fig. (28); and Sleaford (Fig. (5), page 407). At this time plain octagonal piers are sometimes employed with concave faces, as at Wittersham, Kent (Fig. (36), page 407); Utterby, Lincs.

While the shafts of the XIIIth century are usually portions of circles, those of the XIVth are often ogee shape in contour and broadly filleted, *e.g.*, Old Walsingham (Fig. (29), or sometimes may assume the character of groups of roll-mouldings, as at Stoke Golding, *c.* 1275–90; Trumpington (Fig. (20); Warfield, Berks.; the plan thus becoming more intricate. (Compare the early simplicity of the piers of St. Peter's, Northampton, or Calder, with Holbeach, *c.* 1345 (Fig. (12), and note how the type is modified with widened hollow and shrunken shaft, as at Lavenham (Fig. (22), and in Perpendicular times.)

A late Decorated pier is the *oblong cruciform*, as at Grantham (Fig. (13), page 407), a type which holds its own in the XVth century, as at Colchester, St. James (Fig. (14), Brightlingsea (Fig. (30). (Compare also Figs. (6), (7), (11), page 407.)

Perpendicular piers are most typical when mullion-like in form; a lozenge-like version of the Decorated diamond pier plan, the shaftings small and the pier mass prominent once more. (Compare, for example, Austin Friars and Hessett, Patrington and Oxford, St. Mary.) When four cardinal shafts are provided, two usually ascend to support the roof trusses of nave and aisles, and two carry the innermost arch mould (Figs. (22), (44): at Brightlingsea the two latter alone are present.

The Austin Friars' type of pier, however, is a recurrent form as before noted, *e.g.*, Beverley, St. Mary's, Stamford, St. Martin's; while the clustered columnar pattern is sometimes used.

Thus we see that evolution in pier design may be traced through several collateral branches, as shown by the examples given on pages 406 and 407.

CHAPTER XVI.

Doorways.

For small openings of minor importance, the lintel was occasionally employed as an alternative to the arch. The so-called "Caernarvon arch" (page 325), and the flat head and transom of the late-Gothic window are typical examples of its limited use.

In Romanesque, when the square-headed opening is employed for door openings, a relieving arch is turned above the *lintel*, and the flat space between it and the constructional arch of the door is termed the *tympanum*. This was adorned with rich sculpture and ornament, as at Rochester, Kilpeck, and elsewhere. As additional support to the horizontal lintel, corbels were introduced projecting from the jambs, in order to reduce the span, *e.g.*, Ely. (See *Frontispiece.*) Sometimes a central pier is introduced to support the lintel, flanked by a doorway on each side, the entire group being set within the main containing archway of the composition. Such is the favourite ordinance of many a Continental portal.

From the latter part of the XIth onwards till towards the end of the XIIIth century full advantage was taken of the repetition and recessing of the arch orders to obtain a powerful and striking effect; this is specially notable in Anglo-Norman work, when even the wall is thickened in order to provide the desired depth, the doorways so treated having somewhat the aspect of shallow open porches.

The outer and uppermost moulding of the arch which projects beyond the plane of the wall is termed the *hood-mould* or *dripstone*, and at all periods it may be concentric to the curve below. More distinctively characteristic, in the Geometric period, it may assume a gabled outline, which becomes often somewhat steeper in Decorated work or is of ogee contour and richly crocketed, and terminating in a finial. This arrangement also occurs in Perpendicular, but the rectangular form (Fig. 252) is more typical.

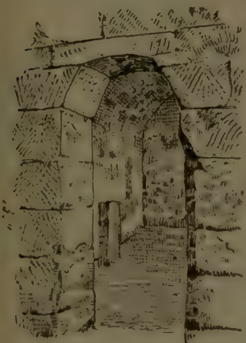


FIG. 321.—Saxon Door.
Hexham Crypt.

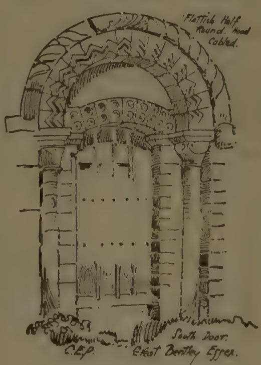

Flattish Half Round. Hood Cabled.
South Door.
C.E.P.
Great Bentley Essex.

FIG. 322.

Byland west door is an early example of the introduction of the foiled arch employed in the door head (Fig. 129), while Nately, Clymping, Rievaulx (Fig. 130), show early attempts at the foliated heads to be developed later at Merstham (Fig. 167), Warmington (Fig. 168), (Woodford, Fig. 325), and Cley.

Anglo-Norman doors are remarkable for the variety of their design and are usually very ornate, set around with many projecting and rectangular arch *orders*, enriched with an intricate overlay of billet, chevron, and other contemporary ornament (page 125), or richly sculptured, as at Malmesbury south porch. The head of the door opening may be semicircular, or the tympanum may be filled in solid and supported by a lintel or a segmental arch, *e.g.*, Great Bentley, Essex (Fig. 322).

In the jambs or vertical sides of the door, shafts supporting the arch orders are set in rectangular nook-like recesses (Fig. 70), with cubical, scalloped and grotesquely-carved caps, as at St. Margaret's-at-Cliffe, Kent; Bristol, etc.

These shafts are usually omitted to the inner order to which the door is hung, and the jambs and arch of this are continuous and run straight down to the ground. The abacus of the capitals of the jamb shafts sometimes is continued along the wall as a string, or may run through as an impost mould to the inner arch order, as at Nately.

In some doors an impost moulding is provided, but the shafts are absent; in others both shafts and impost are omitted and the arch orders run right down to the ground, *e.g.*, Iffley (Fig. 51), Market Rasen (Fig. 84).

Seemingly from sentimental associations these early doors have been preserved in large numbers, while the contemporary windows were taken out in later times and wider ones inserted in their stead, and the general ordinance of the fabric materially modified. When the wall has been thickened out in order to increase the number of orders, it may have been carried up and terminated with a triangular gable set astride of the arch; sometimes a similar shaped hood-mould surmounts the door, *e.g.*, St. Margaret's-at-Cliffe, Kent, when the opening is kept flush with the wall face.

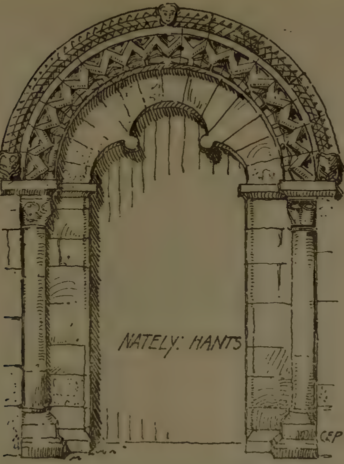


FIG. 323.—Foliated Arch. XIIth century.

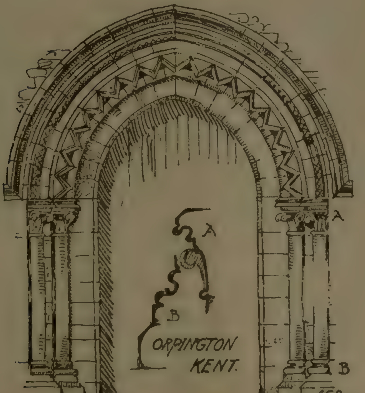


FIG. 324.

Transitional doors naturally partake of some of the characteristics of both Anglo-Norman and Early English work, yet have their own distinctive quality, *e.g.*, Chipstead (Fig. 109), Byland (Fig. 129), Ripon, Selby.

The openings are lighter in proportion, with semicircular or obtusely pointed arches, and the mouldings are more deeply undercut, yet retaining, as at New Shoreham or Glastonbury, the surfaced enrichment and indented moulding inherited from XIIth-century tradition. The jamb shafts are more slender and the caps of these have often naturalistic foliage; while the abacus, as yet still square-planned, usually exhibits some lightening of form with the deep-cut accent of channelled moulding; at the same time the square plinthed base-moulds begin to develop.

During the XIIIth century the doorways are still set out in deeply recessed orders, but the chevron and its kindred intricacies have been discarded, the pyramidal dog-tooth ornament (page 217), or sprays of deftly-chiselled foliage alone trail around the arches, nestling in the deep hollows between the principal roll mouldings, *e.g.*, Warmington. (Fig. 168.)

Though jamb shafts are lavishly used in the richer examples they are often entirely absent in minor work. Like the rest of the shafting of the period they are detached, and slender monoliths of stone or marble entirely support the arch orders above from the door opening to outer face of wall, *e.g.*, Beverley, Ely. (Fig. 135.)

Often these are set so far in advance of the wall structure behind them that a second range of shafts is placed alternately between the outer ones, or again, the intervening salient angles of the recess in which they stand are moulded, producing a very rich effect.

Set thus so closely together, with circular planned abacus and base, the result of this is to obscure the jutting rectangularity so characteristic of the XIth and XIIth centuries, that the jambs become splay-like in aspect, though the receding arch orders may still be found to retain the squareness of their grouping, *e.g.*, Woodford (Fig. 325), Binham, Skelton.

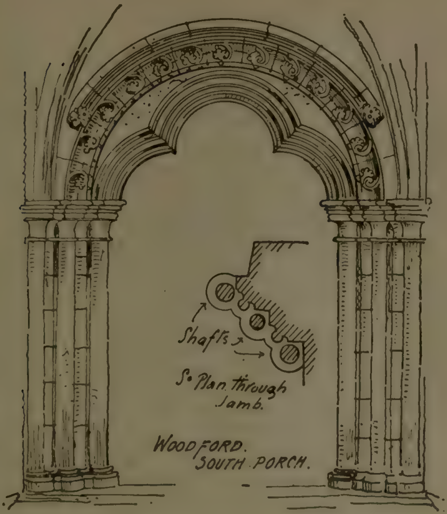


FIG. 325.—Foliated Arch. XIIIth century.

Double doors set within a great arch were in great favour as entrances to the more important abbeys, cathedrals, and chapter-houses, chiefly during the first half of the XIIIth century.

Arches, however, take the place of the Romanesque lintel. At Higham Ferrers and the outer entrance of Westminster chapter-house (Fig. 173) these are segmental, and the flat surface of the tympanum is carved. Crowland has this spandrel piece filled with a quatrefoil and sculpture; at Christchurch Priory, Hampshire, and Ely, galilee (inner door) the arches are foliated, and in the latter the foliated vesica above is pierced right through the wall.

More complex still are the inner doors of the chapter-houses of Westminster and Wells, where the entire head above the twin doors is filled with bar tracery.

We have nothing in England to rival the cavernous, imaged, and gabled portals of Continental use, such as those of Chartres, Amiens, or Abbeville; Salisbury, Westminster, Lincoln (south presbytery door), and the incomplete work of Abbot de Cella at St. Albans, would seem to be our most ambitious examples.

With the disuse of the free standing monolith, and the employment of the engaged shaft, built up in courses with the rest of the jambs, there came a diminution in the scale of doorway composition.

In the XIVth century these openings become much simpler in character; the double doorway goes out of use, and the depth of recessing and the multiplication of moulded orders is reduced. (Fig. 196.)

Correspondingly, we find the shafts much more sparingly used, and an increasing tendency to carry the mouldings of the arch nearly right down to the ground or plinth level, stopping them on a splay. Alternatively, some or all of the arch mouldings die out on a jamb of one or more plain, chamfered, or splayed orders, *e.g.*, Hessett, Suffolk; Silk Willoughby, Northants.; Olney, Bucks.; this is termed the "discontinuous impost." (Fig. 218.)

At Norwich Cathedral the Prior's door from the cloister shows the transition from the earlier to the later ideal in progress. Occasionally the ogee arch is actually employed for the curve of the structural arch; *e.g.*, Abbey Gate, Bury St. Edmunds (Fig. 52);

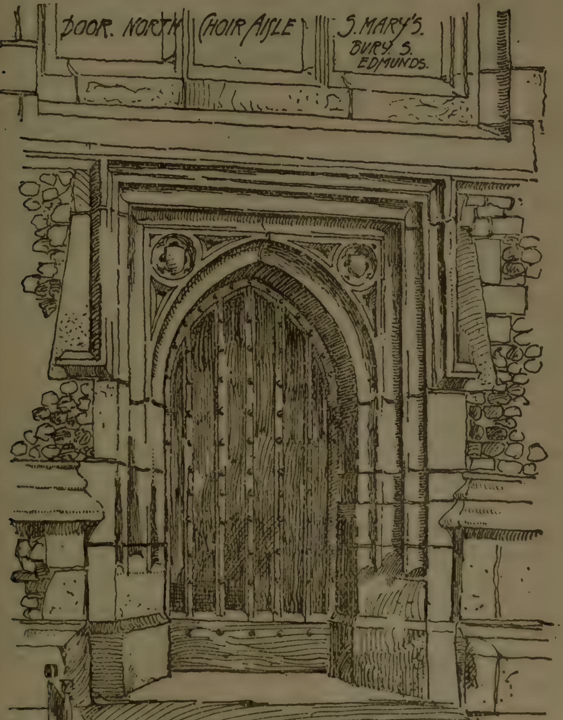

DOOR. NORTH CHOIR AISLE S. MARY'S. BURY S. EDMUNDS.
C.E.P.

FIG. 326.—Perpendicular Door.

Tenby, Peterborough (Fig. 211); Westhall (Fig. 257); Dronfield. In very elaborate examples the arch may be foliated, crowned with crocketed gable and flanked by buttresses, the orders enriched with cusping, panels of tracery, and carving. The caps and bases are sometimes octagonal, and the latter begin to be stilted and rise from a splayed base.

The doors of the Perpendicular period have well-marked characteristics. All, even the most elaborate, are fairly similar in their dispositions. The arches are at first of about equilateral or slightly obtuse proportion, but later the depressed four-centred arch becomes very usual, as at Lavenham, Suffolk.

The head of the doorway is framed within a rectangular hood-mould, and the spandrels between it and the arch are filled in with traceried panels, carving (St. George and the Dragon is a recurrent *motif*), heraldic shields, or foliage, *e. g.*, Fotheringhay (Fig. 252).

In the earlier work the hood-mould follows the curve of the arch, as at Creeting, St. Mary, or it may be of ogee contour (porch, Beverley, St. Mary; Louth, west door).

Sometimes the dripstone is double; an arched hood-moulding being set with a rectangular one.

Though often ornate, the doorways are much simpler and more shallow in depth than those of the preceding centuries; the splaying of the jambs and arch-moulds becomes strongly marked, owing to the moulding lying closely on the chamfer plane. (See page 316.)

The shafting, if not entirely absent (Bury St. Edmunds, Fig. 326), becomes indistinct and unimportant, and merges into the wide and irregular hollows of the casement (page 475). In openings such as the outer entrance of porches (*e. g.*, Ardleigh (Fig. 227), Great Bromley, Gloucester, south porch), where no door has to be hung, it is usually this inner order of the arch which is carried by an engaged shaft, often there are no others; in this position the shaft is rather more bulky than is customary. The wide and shallow hollow is studded with square pateras and flowers.

CHAPTER XVII.

Windows.

Window Construction.—The early Romanesque windows (as previously pointed out) were narrow and restricted in aperture: first, from reasons of defence, to prevent unauthorised entry—secondly, on account of the absence or rarity of glass, and the consequent need of shelter from the inclemency of the weather. Even where glass was available, difficulties of glazing restricted the size of the aperture, while shutters, pierced panels of wood or thin slabs of stone, were employed as substitutes in its absence.

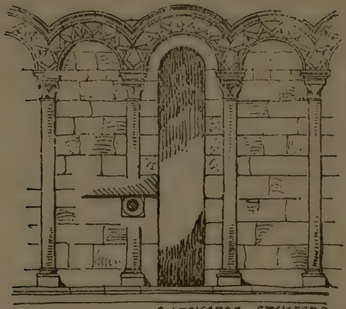

S. LEONARDS. STAMFORD.

FIG. 327.—Transitional Window and Arcade.

In order to diffuse the light internally as much as possible, the internal reveals or window jambs were splayed, instead of being cut straight through (Fig. 32), the splay being carried around the head of the window; such a window is termed "*bonnet-headed.*" (Figs. 34, 85.)

While the Saxons placed their windows in the centre of the wall, and provided splays both externally and internally, the Norman method (with their walls constructed with a rubble core, faced with two outer skins of better material), was to employ a single internal splay for their windows, in order to facilitate construction by thus avoiding the necessity of building through arches over each window, the glass line being placed close to the exterior face. The window arch of the aperture thus supported the external facing stones, while an inner arch in like manner served to carry the internal facing; the rough core of the wall structure resting on a rough arch. (See Fig. 328, A, B.)

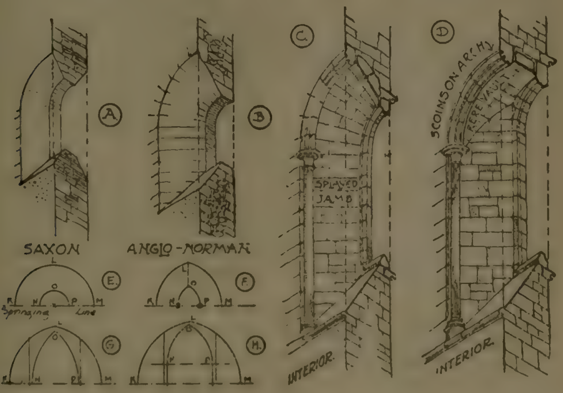


FIG. 328.—Window Construction.

The concentric bonnet-headed window, as will be seen, involved keeping the apex of the actual opening of the window lower than was often desirable (Figs. 120, 131), especially where the splay of the jambs was considerable. Though this arrangement is met with during the Lancet Period, a more effective method presented itself.

Instead of the apex of the inner wall arch, termed the "*scoinson arch*," being at a higher level than that of the "*window arch*," as in Fig. 328, C, F, these were arranged to be approximately level; though they might be relatively higher or lower as convenience might dictate. (Fig. 328, D, G, H.)

The splayed jambs were retained, and as the radius of the wider scoinson arch was therefore greater, its curve was flatter and more open than that of the narrower window arch: sometimes the springing of the scoinson arch was dropped to a lower level than that of the inner arch of the actual window opening. The intermediate arch, supporting the core of the wall, termed the "*rere vault*," was more or less concentric with the scoinson arch.

This system allowed of great latitude in arrangement: the scoinson and window arches could be placed at the level most convenient to each, and the rere vault adjusted between them. This system comes into use about 1200.

The rere vault sometimes, as at Tintern, interpenetrates with the splayed jambs: in important examples it may be moulded with ribs laid on its surface, as at Ripon; or, more elaborately still, it may be treated with a miniature vault, as at Christchurch Priory, Hampshire.

So, too, the scoinson arch may be quite simple, just perhaps a chamfered rib dying out on the splayed side of the window jamb, or it may be moulded and carried by an angle shaft (Ely Place, London); or more intricately still, the arch may be filled in with open unglazed tracery, as at Stone Church, Kent. But elaboration such as this went out of fashion in the later Gothic owing to the thinning of the walls, and except in such examples as York choir, where the scale of the building demanded scientific skeleton construction in order to obtain both lightness and strength in structure.

In the merciless logic of French Gothic, as at Amiens nave and elsewhere, so entirely is the wall eliminated that the scoinson arch and the wall rib of the vault are one and the same: an English example of this system is the chapter-house at Salisbury.

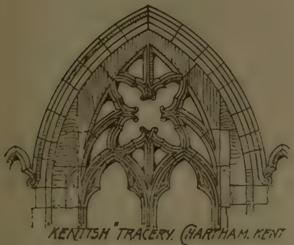


FIG. 329.

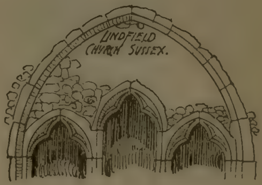


FIG. 330.

Subordination of tracery.—The combination of two or more *lights* juxtaposed beneath a common containing arch,—the consequent expansion of window area,—and the desire to reduce the intervening *mullions* and *tracery bars* to a minimum—necessitated steps being taken to ensure the stability of a window of many lights. (Fig. 330.)

This additional reinforcement was contrived by thickening out (in the direction of the thickness of the wall from inside to outside) one or more of the mullions and tracery bars.

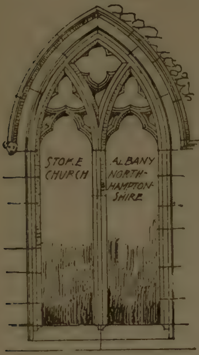


FIG. 331.

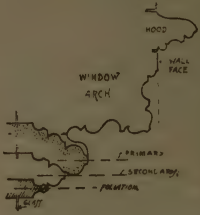


FIG. 332.
Hawton East Window.

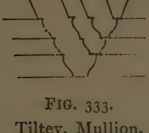


FIG. 333.
Tiltey, Mullion.
Subordination of Tracery.

Analysing the structure, we thus have the *window arch* and *jambs* of one or more orders, whose function was (as before noted) to support the superincumbent weight of the wall fabric; inset within this structural frame were placed the mullions and tracery bars which only needed to be sufficiently strong to be self-supporting. (Figs. 330, 331, 332.)

To obtain additional rigidity for these latter, we find the principle of the arch in recessed orders (see page 326) applied in the construction of these mullions and bars; the principal members being reinforced and increased in depth,—that is, in the direction of the thickness of the wall, and were more richly moulded, being of perhaps two or more "orders," while the lesser mullions and bars had perhaps but one "order" and were of less thickness.

By this means the leading or principal lines of the tracery were duly emphasised, and the same system will be found carried out in the arrangement of the cusping and foliation in the heads of the lights. Tracery, like the sub-orders of an arch, is therefore arranged in receding planes, and this system is what is termed "*subordination of tracery*." At Guiseley (Fig. 176) we see this in an early form; analysed, this four-light window is composed of a window arch enclosing a primary "*doublet*," each arch of which in turn encloses a smaller secondary "*doublet*"; as may be seen, the primary mullions, arches, and circle are thicker and more prominent than those of the lesser doublets.

At Guisborough (Fig. 178) and Selby east window (Fig. 199) the same system is followed, though more elaborately, and by this means it was possible to build up the fairy fabric of vast windows, such as those of Carlisle, York, and Gloucester (Fig. 229), in which each part was adequately proportioned to the work it was called upon to do.

At Durham east transept, York east window and elsewhere, the principle is carried yet further; the inner scoinson arch is lightly filled in with an open skeleton framework, corresponding to the main lines of the design of the external window, and the two systems and planes of tracery are bonded together at intervals with through stones, giving a light and rigid structure, while at the same time obtaining the maximum of unobscured space for the display of painted glass.

At Gloucester, Sherborne, Warwick, the pier-like principal mullions are further stiffened externally with a buttress.

Tracery is classified sometimes by the character of the outer member which forms the profile of the bar or mullion, thus:—

(1) *Roll tracery* (Fig. 334, A, B), most common during Geometrical.

(2) *Fillet* tracery (Fig. 334, C, D, E, F).

(3) *Edge tracery* (Fig. 334, G), which was in vogue for a short time during the latter part of the Geometrical and the early part of the Curvilinear periods, *e.g.*, Lawford, Essex; Canterbury Cathedral—St. Anselm's Chapel.

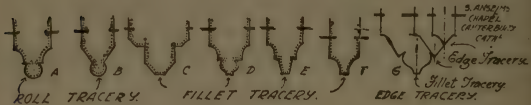


FIG. 334.

Considerable ingenuity and constructional dexterity is exhibited in the disposition and jointing of the various small stones of which the tracery network is built, so that it might be often possible to remove one or more stones for the purpose of repair, without disturbing or taking out the greater portion of the tracery.

In proportion, the early mullions were little more in depth than in width, but as they narrowed so they also became deeper and more lozenge-like in plan outline.

During the Geometrical and Curvilinear periods, the boundary line between the mullions below and the tracery bars above was marked at the springing of the arches by small capitals, the former being treated as a diminutive shaft or group of shafts, the latter being regarded as an arch: so we find that just as in arch and pier, so does the section of the tracery bar differ from the mullion of the light. (Fig. 178.)

With the disuse of the cap, as this member in the course of constructive evolution gradually loses its *raison d'être*, so likewise do the moulding profiles above and below the springing line become ever more alike, till with the practical suppression of the cap in Perpendicular windows the mouldings become continuous and identical.

As an example of transition, at Heckington—though small capitals are retained—yet the profile of both mullion and tracery bars is the same.

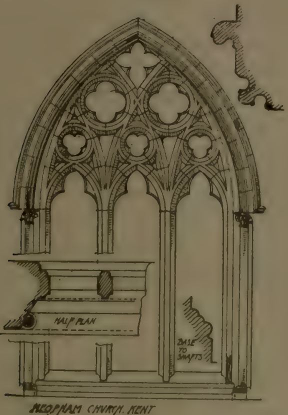


FIG. 335.—Geometrical Tracery with Soffit Cusps.

Cusping.—The use of the foiled arch, (Byland west door, Furness triforium Figs. 129, 149), as we have seen, led on to the employment of the foliated arch (Figs. 130, 135, 168), Rievaulx refectory, Merstham, Warmington, Ely west doors. Concurrently with this and the foiling of the head of the window light, there appears a simpler form of foliation, obtained, not by enclosing a foiled arch within a pointed arch, but by obtaining a foiled head to the window light by the addition of a triangular-shaped piece of stone or "*cusp*," projecting from the soffit of the arch of the window head, one to each segment, which is termed a "*soffit cusp*." This appears in lancet windows after *c.* 1225. The early soffit cusp is quite plain and square-edged (Fig. 336, A), later they may be moulded, and it is interesting to compare this type with the earlier examples of Romanesque foliated doors, such as the Prior's door, Ely; Nately, (Fig. 323); Ripon. With the introduction of tracery and the consequent reduction of the substance of the mullion, the *cusp* underwent change, and during the Geometrical period, foliation came into extensive use.

The cusps become thinner from back to front, and though in the heads of vertical lights they are worked "out of the solid" block or bar of stone forming the arch of the "light" (Fig. 336, A, B), it would seem that often the foliation of circles, etc., set in the tracery of the window head, was obtained by inserting independent cusps, cut out of separate stones, and set in a groove (Fig. 336, C). In course of time these might be dislodged, fall out, or be destroyed and not replaced, thus accounting for the fact that in some Geometrical windows, the circles, etc., are now uncusped while the heads of the lights, cusped in the solid yet remain complete.

Chamfer Cusps.—With the perfecting of bar tracery, the next development was to make the cusp an integral portion of the actual inner moulding or splay of the window tracery, as in Fig. 336, F, instead of simply applying it to the arch soffit. The outer edge being now moulded, the plain flat surface, as at Figs. 336, A, B, was sunk or pierced (Fig. 339), forming an "*eye*"; in early examples this eye is often imperfectly formed (Fig. 336, L), being chamfered or moulded on one side only. At Netley (Fig. 156), Cartmel, the eyes are absent, the cusps being formed by simply widening out the cross section of the tracery bar as required. (Fig. 336, E.)

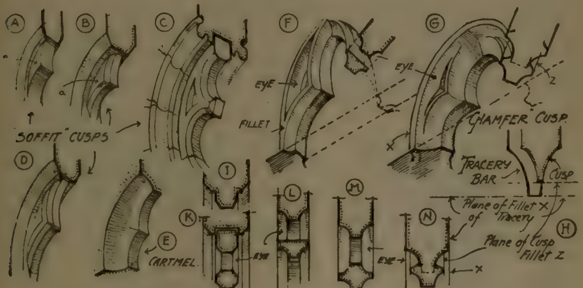


FIG. 336.—Cusps and their formation.

Later on the eye is splayed away or moulded on both sides (Fig. 336, M), and then finally the cusp is formed by taking a portion only of the total profile of the inner moulding, the cusp fillet being worked on an inner plane and dying into the moulding as at Fig. 336, G, H, N.

The "*chamfer cusp*"—as this later pattern is called—comes into general use during the late XIIIth century (though it is occasionally met with in Lancet), and supersedes the soffit cusp (which is rare after 1300), remaining the standard pattern till the end of the Gothic story.

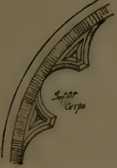


FIG. 337.
Soffit Cusp.

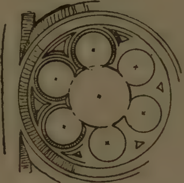


FIG. 338.
Foliated Circle.

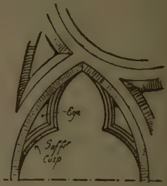


FIG. 339.
Soffit Cusp.

Geometrical Cusps.

Cusping or foliation received its greatest elaboration during the Decorated period, when compound or

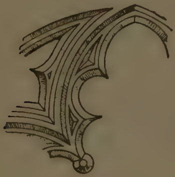


FIG. 340.
Cley Church (Dec.)

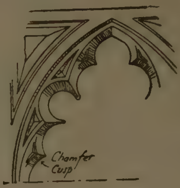


FIG. 341.
St. Albans (Perp.).

Double Foliation.

double foliation was elaborately practised; an arch or opening itself being first cusped, and these greater cusps or primary foliations being in turn cusped by secondary foliation, *e.g.*, Cley Church, west door; tomb of Aylmer de Valence, Westminster; Percy tomb, Beverley, Ely Lady chapel, etc.

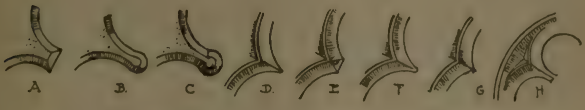
During Geometric and Decorated the cusps are distinct and prominent, the heads of the lights, etc., being usually *trefoiled* and bold. (Figs. 199, 335.)

With the compacting of the chamfer cusp, and its subordination to the profile of the inner moulding of the aperture from which it springs and forms part (Fig. 336, G), it becomes smaller and projects less, and at the same time the foliations multiply, the heads of lights being customarily *cinquefoiled.* (Figs. 231, 238.) Such is its aspect in late Decorated and Perpendicular work.

In addition to the foregoing, there are other characteristics of the cusps which form important criteria of date.

The early cusps are sharply pointed or terminate in a blunt, square tip (Fig. 342), a knob, or ball of foliage, and the foils are formed from tangent circles, enclosed within an outer, and cut by an inner circle. (Fig. 338.)

Later, in Decorated work, the cusps are not so acutely pointed at the tip, the foils being set out from intersecting segments of circles (Fig. 340), while in Perpendicular the tips of the cusps are formed as in Figs. 341, 342.



A, B, C, D, E, Geometric. F, G, Decorated. H, Perpendicular.

FIG. 342.—Cusp Points.

In elaborate work the tips of the cusps are enriched with foliage, flowers, heads, and even diminutive images. (Figs. 169, 343.)

It should be noted, however, that the difference between the soffit and the chamfer cusp is not always distinct, and that there is a class of examples which seem to combine many of the characteristics of both types, as at St. John's, Cley, Wells chapter-house arcade. (Fig. 223.)

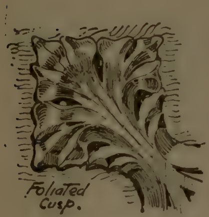

Foliated Cusp.

FIG. 343.
Dickleburgh, Norfolk.

In examples of this kind the cusp is a chamfer cusp, insomuch that its splay is continuous, but so are the foliations of Westminster triforium; at the same time, it belongs to the soffit class, because it is applied (albeit continuously) below the soffit of the inner moulding. The eye, too, is pierced, and much of the character of a foliated arch in miniature is present.

Evolution of tracery.—In studying examples of tracery, the variety of which is bewildering, it is interesting to note the perpetuation and survival of the earlier *motifs* of lancet-grouping. Some of the more usual types of structure met with in two- or three-light windows are shown in diagram form in Figs. 150, 151, exhibiting the modifications undergone by, and at the same time the survival of, the original parent types.

The "doublet" window (page 191)—shown in its earlier forms in Fig. 148, Fig. 150, (5), (9), (13)—when duplicated and repeated, expands into Fig. 151, (16), (17), while later it assumes the forms shown in Fig. 151, (20), (27), and (31).

The simpler two-light window of twin lancets without the circle or "centre piece" above, Fig. 150,

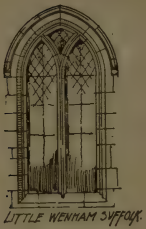

LITTLE WENHAM SUFFOLK.

FIG. 344.

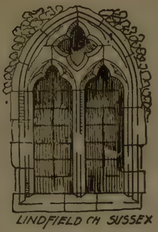


FIG. 345.

(4), (8), (12), is elaborated by foliation and tracery, as in Fig. 151, (19), appearing later as in Fig. 151, (26), (30), (35).

The three-light window of graded lancets, Fig. 150, (6), (10), (14), may be traced in its successive aspects in Fig. 151, (24), (33), (36); Fig. 233, Winchester; Fig. 238, Blythburgh.

So, likewise, the intersecting triple lancet, Fig. 150, (15), when expanded, forms the *motif* of windows such as Fig. 151, (18), Fig. 335; reacted on by the "doublet" it is modified and appears as in Fig. 151, (22), (25), evolving into the "reticulated" or network pattern of Fig. 151, (29), finally simplified as in Fig. 151, (32). (Compare also Fig. 231.)

But analysis of these tracery origins will quickly show that the various types react and borrow of each other liberally, and that one single example may be composed of a combination of several *motifs* in setting out.

CHAPTER XVIII.

Roofs.

Development.

Not less interesting than the development of the stone vault is that of the wood roof, in construction and treatment, though this occurred rather later; improvements introduced during the XIIIth century were perfected in the XIVth, and the craft reached its maturity after 1400.

At first, up to the middle of the XIIIth century, the efforts of the carpenter were directed mainly to making a sound piece of construction. Meanwhile, he was perfecting his technical skill, but his decorative expression was a rather lame transcription in wood of the common forms of mason craft, as we may see not only in the early roofs, but in the remains of internal woodwork which have survived. There is in South Kensington Museum a XIIIth-century arcaded door which is an interesting example of the naïve dependence of the woodworker on the mason for decorative *motifs* at the time. (Fig. 346.)

But once the carpenter realised the fulness of his technical skill and ability, he began to think (and this vigorously) for himself, and swiftly discarded masonic incunabula, and not only developed, on true Gothic principles, a complete system of "*framed*" construction, progressive on parallel lines to that of the mason's "*arcuated*" system, but then proceeded to decoratively elaborate it in becoming fashion, and clothed his structural roof shelter with comely grace.

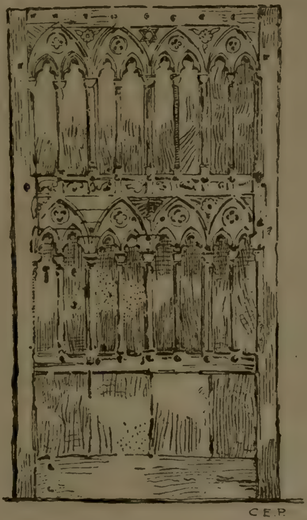


FIG. 346.—XIIIth-century Door.
South Kensington Museum.

Though the triumph of the woodworker was later than that of the mason, it was every whit as complete and glorious, and it was in the building up of mighty roofs that this great opportunity came.

Many would deny the fulness of Gothic achievement to buildings which are unvaulted, but such a completeness of finish was not demanded, nor even economically possible to the buildings of lesser importance.

For the real essence or spirit of Gothic art lies not so much in the presence or absence of this particular feature, or that method of construction, but rather in the giving to each structural feature, or material, the treatment suited to its own peculiar circumstances and expressive of its individual properties and purpose. Stone, brick, wood or metal, arched vault or framed truss, were but means to an end.

Pitch.

The early roofs of the XIIth century were inclined at an angle of about 45 degrees. This slope is called the "pitch." During the early-XIIIth century the inclination of the roofs tended to become steeper. In England after this they became gradually more and more depressed, till at last they are often externally invisible behind the parapet. Æsthetically this is to be deeply regretted. It has been suggested that this is owing to the decaying of the rafter feet. When the roof had to be taken down for economical reasons, the decayed portions were cut off and the sound timber re-used. This shortening of the timbers or rafters led to a consequent lowering of the pitch.

But the determining factor was that with the use of lead as a roof covering, a steep pitch was unnecessary.

The "pitch" is governed by question of climate and external covering. Where much snow is usual, a steep pitch is necessary to throw this off the sides of the roof to prevent this loading it heavily.

Absence of rain, again, in the East and elsewhere, allows of the employment of a flat roof.

Again, tiles require a steeper pitch than slates to be weather-tight, while lead permits of an almost level roof.

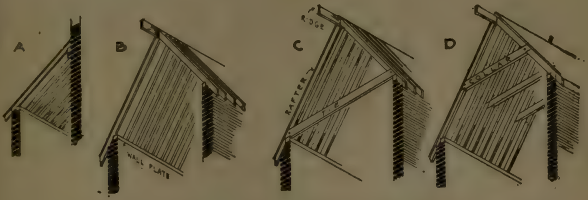


FIG. 347.—Lean-to, and Double Slope Roofs.

Framed Construction.

We may classify roofs as "single slope" or "lean-to," such as aisle roofs (see Fig. 347, A), and "double slope" as covering a nave. (Fig. 414.) They are constructed with a framework of timbers, termed rafters, on the back of which rest the battens or boarding immediately supporting the external covering of slates, tiles, or lead.

In "lean-to" roofs the ends of the rafters are fixed to longitudinal timbers termed wall plates, in double-sloped roofs the feet of the rafters are secured thus while the upper ends abut. (Fig. 347, B.)

Such a roof has an inclination to spread like an arch, and this force, or "*thrust*" is resisted by the wall. Where this resistance of the inert weight of the wall is insufficient to ensure stability, other means must be adopted to "tie" the roof together.

Now suppose a rectangle, A B C D, of timber is fixed together, pinned at the corners, it has no resistance to offer against some external force, E, which tends to make it change its shape as at A′ B′ C′ D′ (Fig. 348). If, however, we add a diagonal brace or strut, A D, it becomes rigid and will remain so unless the force is sufficient to fracture part of the structure.

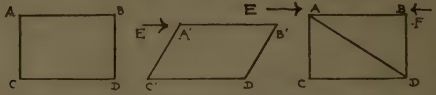


FIG. 348.

If the force acts at E, the strut, A D, is in *compression* (distance A D tends to decrease), but if the force acts at F, the strut or brace is in *tension* (distance A D tends to increase), in which case a cord or chain could be substituted, which would be useless to resist a force acting from direction E. (Fig. 348).

This "*triangulation of structure*" is the expedient by which framed construction achieves rigidity.

Such a roof as Fig. 347, B, is, of course, limited to small spans. When these are exceeded, further intermediate support becomes requisite, as in Fig. 349. The simplest method is to rest the rafters on beams, called "*purlins*," running at right angles to the direction of the rafters. These in turn may be supported at intervals by tranverse walls carried on arches, as in certain Romanesque churches, *e.g.*, Boscherville; aisles originally of St. Peter's, Northampton; the Archbishop's Palace, Mayfield, Sussex; or, as more usual, by an assemblage of timbers called a "*truss*." (Fig. 350.)

In mediæval carpentry the various members of the roof were framed together by means of

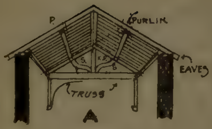


FIG. 349.

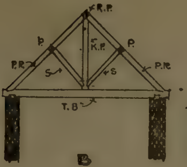


FIG. 350.
King Post Roof.

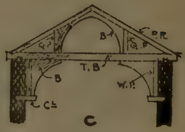


FIG. 351.
Queen Post Roof.

"halving," "mortising and tenoning," and pegged together by means of wood pins: no metal fixings, nails, straps, and the like, were employed for this purpose.

Tie Beam Roofs.

The simplest form of trussed roof is that of the "*tie beam*" type. (Fig. 353.) Strong beams are laid transversely across from wall to wall at intervals (Fig. 349.) On these are laid the inclined "*principal rafters*" supported at their head by a strut or *king post carried by the tie beam*, with longitudinal beams *(purlins* and *ridge piece)*, spanning the space between the adjacent main *trusses*, and on which rest the intermediate or *common rafters*.

The modern system of supporting the tie beam (Fig. 352), utilising the king post *suspended* from the apex of the truss, was not in vogue during the Middle Ages.

REFERENCES TO FIGS. 349, 350, 351:—

T.B.—Tie beam.
K.P.—King post.
Q.P.—Queen post.
P.R.—Principal rafter.
P.—Purlin.
S.—Strut.
R.P.—Ridge piece.
B.—Brace.

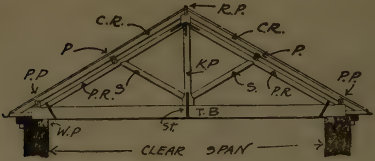


FIG. 352.—Modern King Post Truss.

To correct the tendency of the tie beam to yield or sag under such a load, the mediæval builders *cambered* it, *i. e.*, shaped it into the form of a flat curve upwards, *e. g.*, Long Melford; Mildenhall.

Further, to additionally support it, curved braces were introduced bracketwise beneath, as at Louth. Sometimes these extend archwise across the entire span, as at St. Nicholas', Lynn.

A roof of this description required very strong timbers for the tie beam, and such were not always obtainable, and it was the cumbersomeness of its early use that suggested the further development of the "*trussed rafter*" type, which came into use early in the XIIIth century.

But in the XIVth and XVth centuries, owing to its simplicity of structure, the tie beam roof came back into favour again, notably in Mid England, owing to the deftness of the carpenter craft, which achieved a marked lightening of its structure as early at Polebrook and Raunds, and later at St. Martin's, Leicester, Holy Trinity Chapel, Cirencester, and St. Margaret's, Lowestoft.

REFERENCES TO FIG. 352:—

T.B.—Tie beam.
K.P.—King post.
W.P.—Wall plate.
P.R.—Principal rafter.
P.P.—Pole plate.
R.P.—Ridge piece.
C.R.—Common rafter.
ST.—Strap from K.P. to T.B.

At North Walsham, in order to relieve the centre of undue stress, instead of one central *king post*, two struts or *queen posts* are introduced, bringing the load nearer the extremities of the beam, with brackets and "*wall piece*" below. Mildenhall and Gedney have arched braces below the beam to stiffen it. (Figs. 353, 415.)

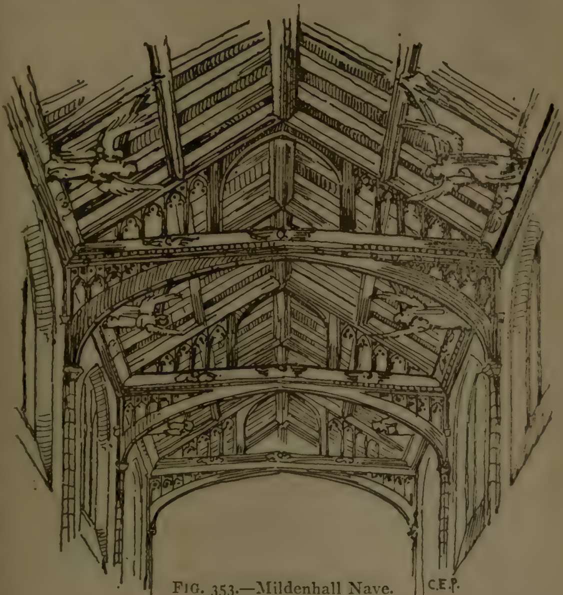


FIG. 353.—Mildenhall Nave.
Tie Beam and Queen Post Roof.

Sometimes the tie beam serves as principal rafter as well, and the roof becomes very flat, indeed almost a ceiling, as at Raunds, Northants.; St. Andrew's, Norwich; Hessett, Suffolk.

Trussed Rafter Roofs.

A series of experiments led to the adoption of this form of roof so largely used during the XIIIth century.

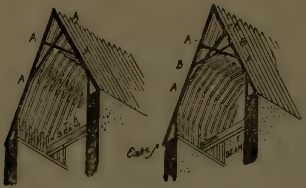


FIG. 354. FIG. 355.
Trussed Rafter Roofs.
A A, Diagonal Ties. B B, Collar.

Returning then to the double-slope roof (Fig. 347, B), we add a tie or "tie beam," fixed to the feet of the rafters and to the wall plate. Where internal height is an object, this tie may be placed higher up as a *collar*, which acts both as a strut or a tie to the inclined rafters it connects together, or two *diagonal braces* may be substituted. (Figs. 347, C, D, 354, 355.)

It was the mediæval practice to carry the walls up to the level of the eaves, finish off flush, and place the *wall plate* in the centre of the wall. Sometimes these were double framed, or as at Heckington, one central and one internal wall plate were employed.

Therefore, on top of a thick wall, when it was necessary to allow the rafters to overhang the outer face to obtain a "*dripping eaves*" (Fig. 356), the feet of the rafters were brought down and fixed on to short transverse timbers called "*sole pieces*," these in turn resting on the wall plate.

To further connect these together, a short "*strut*" was carried up from the inner end of the sole piece and fixed to the under side of the rafter, thus ensuring a good *bearing*. Such a roof, consisting of pairs of rafters, triangulated thus at the feet, and tied together towards the upper part by collars or braces, is called a "*trussed rafter*" roof. Obviously, this system of construction does not require the assistance of framed trusses or principals to support it, as each "couple" or pair of rafters become self-sustaining.

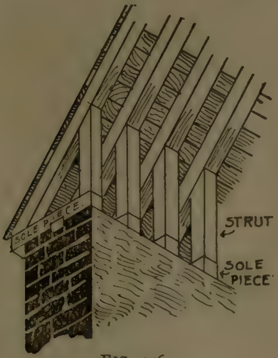


FIG. 356.
Foot of Trussed Rafters.

For, in the same way as the mason was obliged to build with small stones, in like manner was the carpenter compelled to employ small scantlings, in order to avoid the necessity of transporting unwieldly masses of timber out of which to build up his trusses.

The advantage of the trussed rafter roof, moreover, was that it gave additional interior headroom, valuable alike over a vault and within the parish church. These roofs have sometimes only diagonal ties, as at Stuston; but to stiffen the construction a "*collar*" is more usually employed with "*diagonal ties*" which are "halved and pinned" to "*rafter*" and "*collar*" (Fig. 355), as at Heckington south porch, while "*double collars*" (Fig. 357) are employed at Wimbotsham and Stowe Bardolph. To further tie the sides of the roof together, and also the supporting walls, "*tie beams*" are sometimes introduced at intervals (Fig. 359), as at Clymping.

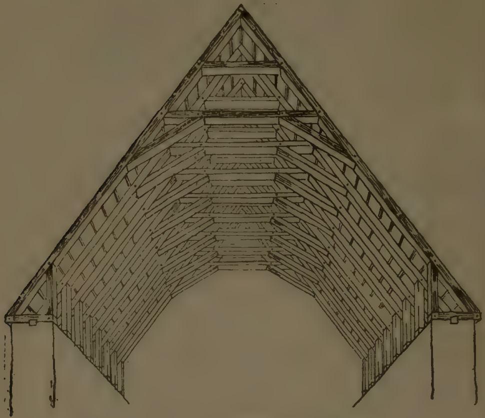


FIG. 357.—Stowe Bardolph, Norfolk.
Trussed Rafter Roof.

The great defect of a trussed rafter roof with its series of light trusses set closely together, was that there was little longitudinal connection between the adjacent *couples* or pairs of rafters, except that afforded by the boarding, and these might easily incline from the vertical.

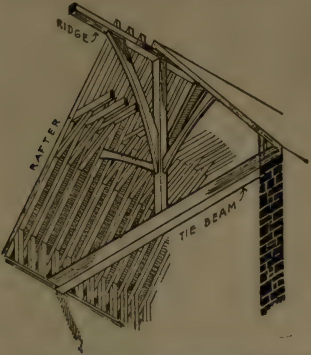


FIG. 358.—Trussed Rafter Roof, with Tie Beam, King Post, Ridge Piece, and Strut.

To remedy this, a central strut or king post was set up on each tie beam to support a longitudinal "*ridge piece*" (Fig. 358), to which the

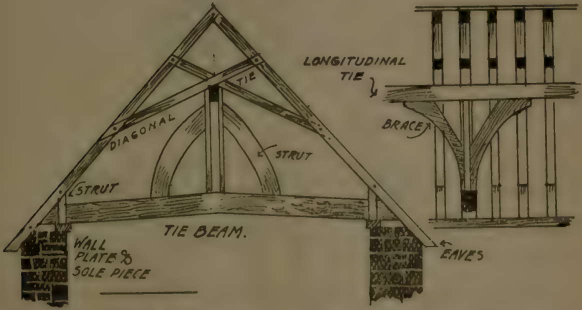


FIG. 359.—Trussed Rafter Roof, with Tie Beam and King Post, etc. Gisburne, Yorks.

rafters were severally attached. Sometimes additional struts are employed, springing from the king post, to further support the intervening span of the ridge piece, as at Wiggenhall, St. Mary.

Having become thus skilful in the construction of wood framing, the builders began to see that the trussed rafter roof was not quite as economical in timber as was desirable. So they reverted to the type of double-framed roof once more, perceiving the possibility of building up a strong truss out of relatively light timber.

Arch-braced Roofs.

The polygonal form of the trussed rafter roof was a close approximation to an arched form, and it was a slight step to substitute a continuous curved strut or "*arched brace*" for the short straight struts (Fig. 360), as we may see at Faringdon or Solihull.

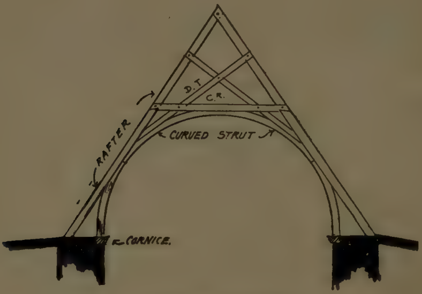


FIG. 360.—Solihull.

The next step was to construct *trusses* or *principals* only in this fashion, the intervening common rafters simply sloping upwards, as at the chancel of Pulham, Norfolk. Here the collar is dispensed with, but a new departure is made for the vertical struts at the foot of the "*principal rafters*," and the arched braces, which are very slender, descend *below* the level of the "*cornice*" and top of wall, providing a shouldered abutment for the truss. This was a very valuable innovation, as at Brinton, Sall, for it prevented the roof sliding outwards along the top of the wall, and gave it a grip on the whole of the upper courses.

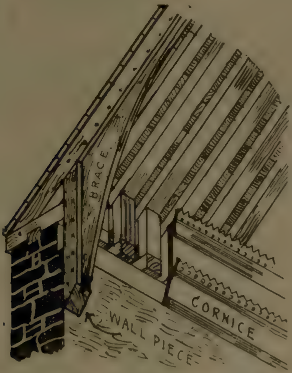


FIG. 361.—Foot of Arch-braced Truss, showing "Wall Piece."

These braces are usually tenoned, and pinned into a vertical timber termed the "wall post," and form the "wall piece." (Fig. 361.)

Alternatively, the arch-braced roof may have been evolved in parallel development by the endeavour to avoid loading the centre of the tie beam with king post or struts. (Compare the trusses from Llanaber (Fig. 366).)

At Bradfield Combust, Suffolk (Fig. 367); Pulham St. Mary's, Norfolk (nave); the principal rafters are stiffened by curved braces instead of being strutted up from the tie beam.

In the case of churches where in the XVth century the almost continuous range of wide and lofty clear-story windows left but weak, slender piers of wall remaining, on which to support the weight of the roof, a further development was employed. A stone corbel was inserted lower down towards the cill level of the clear-story windows, and this supported the "*wall posts*," which were also braced longitudinally from truss to truss by the "*cornice braces*," framed around the heads of the windows. (Fig. 363.) This expedient brought the weight of the roof well

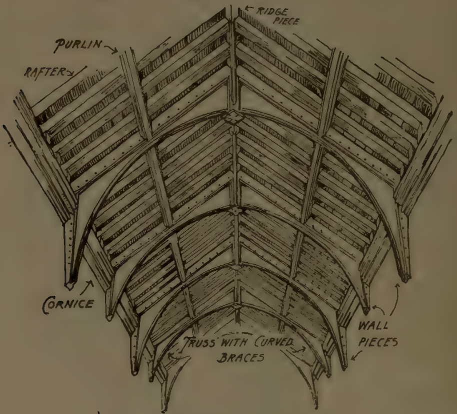


FIG. 362.—Starston, Norfolk. Arch-braced Roof.

down, and was especially valuable in the construction of the hammer-beam type of roof. (Fig. 365.)

Some of the arch-braced roofs are exceeding daring in the ingenuity and lightness, *e. g.*, Sall.

At Starston nave (Norfolk), as at Pulham St. Mary Magdalen (chancel), the collar is boldly discarded; but in the nave of the latter church the collar is wisely retained.

Hammer-beam Roofs.

The arch-braced type easily develops into the "*hammer-beam*" roof, which receives its name from its distinctive feature. The long timber, so called, which lies parallel to the rafters

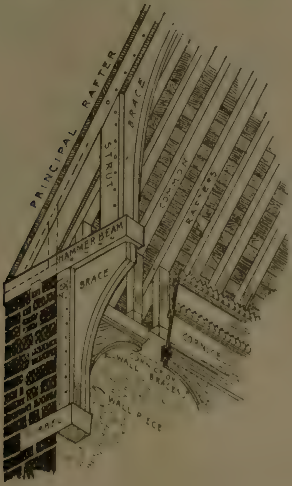


FIG. 363.—Hammer-beam.

and transversely across the top of the wall, and overhangs the inner face (Fig. 363), somewhat resembles the end of a tie beam, the central portion of which has been cut away. As may be seen in Fig. 356, this *hammer-beam* is nothing else than an enlarged and elongated version of the *sole piece* and *strut* at the foot of the trussed rafter roof, plus the addition of the wall piece and brace below. This expedient enabled support to be given to the principal rafter at a higher level, and where it was more effective.

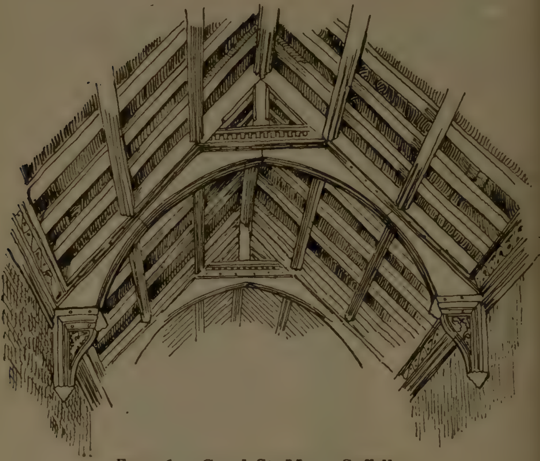


FIG. 364.—Capel St. Mary, Suffolk. Hammer-beam Roof.

A comparison of the trussed rafter, arch-braced, and hammer-beam roofs, will show how the latter type was developed from the other two, taking sole piece and strut from the one, and *wall piece* and *curved braces* from the other.

Some of the simpler hammer-beam roofs, as at Capel St. Mary and Palgrave (Suffolk), owing to absence of struts or collar, or both, approximate very closely to the arch-braced roof, for, in such as these, the hammer-beam is of slight proportion and the wall piece small, or the latter may be even absent, *e.g.*, Outwell, Norfolk, south aisle. (See Fig. 365.)

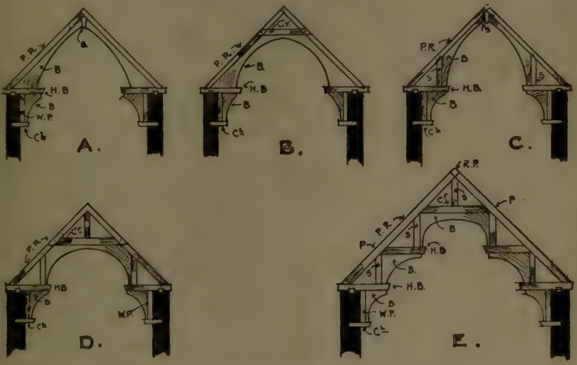


FIG. 365.—Types of Hammer-beam Roof.

Hammer-beam roofs may be classed thus :—

(A) With hammer-beam and braces, but without collar and struts, *e.g.*, Palgrave, Outwell aisle, Wymondham nave ;

EFERENCES TO FIG. 365 :—

H.B.—Hammer beam.
W.P.—Wall post.
CL.—Corbel.
CR.—Collar.
P.R.—Principal rafter.
B.—Brace.
S.—Strut.

(B) With hammer-beams, braces, and collar; no struts.—Capel St. Mary (Fig. 364), Rougham, Great Barton, Suffolk;

(C) With hammer-beam, braces, and struts, but no collar.—St. Stephen's (Norwich), Worstead, Trunch, Bressingham;

(D) With hammer-beams, braces, collar, and struts.—Little Welnetham, Fressingfield; St. Mary's, Bury St. Edmunds;

(E) Double hammer-beams, braces, struts, and collar.—Bacton, March, Great Bromley (Fig. 235), Knapton, Tostock, Woolpit.

Many of these roofs are exceeding ornate and gorgeous, with richly-moulded timbers, crested and battlemented, the hammer-beams carved into the form of angels with outstretched wings bearing the instruments of the Passion, shields charged with sacred symbols or coats of arms, while other representations of the heavenly hierarchy hover about the timbers, nestle among the cornice, or support the wall pieces. Such is the nave roof of St. Mary's, Bury St. Edmunds.

The special habitat of the hammer-beam roof is East Anglia, but around London there are

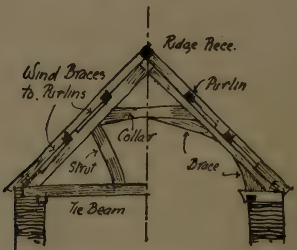


FIG. 366 —Llanaber Nave.

some examples, for instance: Eltham Palace, Hampton Court, Middle Temple Hall.

The magnificent and complex roof of Westminster Hall has curved arched braces in addition to the hammer-beams.

Barrel Roofs.

The trussed rafter roofs were often boarded on the under-side, as at Wimbotsham, forming a *barrel* or *waggon* roof. The favourite type of roof in the West of England is one with curved braces fixed inside the rafters and collar, and boarded as at Dunster, Kilkhampton, Morwenstow, or panelled as at Crowcombe, Somerset.

Wood Vaults.

There are many examples of this method of treating the internal roof, but it can hardly be regarded as being satisfactory, inasmuch as it is an imitation in wood of a purely structural masonic form.

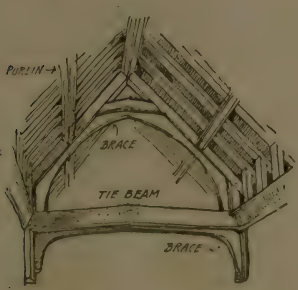


FIG. 367.—Bradfield Combust.

It occurs early in Warmington Church, Northants., again at St. Albans' presbytery, *c.* 1300, Selby choir (Fig. 195), York nave (Fig. 305); while Winchester choir and the very intricate and gorgeous ceiling vault of the chapel at Hampton Court Palace shows its persistence. The latter is a decorative transcription of the later pendant and lierne vaults, and it is interesting to compare it with the vault of Bishop West's chantry at Ely.

Aisle Roofs.

Where there was a clear-story to the nave these were usually "lean-to," but if the aisle was wide they are of gabled form, with double slope, and of trussed rafter, arch-braced, or even hammer-beam construction. Sometimes, as at Skelton, North Walsham, the slope of the nave roof is continued over that of the aisles. (Fig. 409.)

In lean-to roofs, usually inclined principals occur at intervals (with, perhaps, curved braces and wall pieces below. St. James', Bury St. Edmunds; New Walsingham), and these support the purlins which carry the common rafters, as at Bramford, Ixworth, Suffolk.

At Mildenhall a curious single hammer-beam treatment is employed to support the principals.

Though in most cases the coloured decoration of these roofs has perished, where it remains—St. Mary's, Bury St. Edmunds; Bacton, Knapton, Great Bromley, Palgrave, and Ely—the result is very splendid. Often the easternmost compartment above the rood screen was alone so treated, when the remaining bays of the nave roof were devoid of polychromatic decoration.

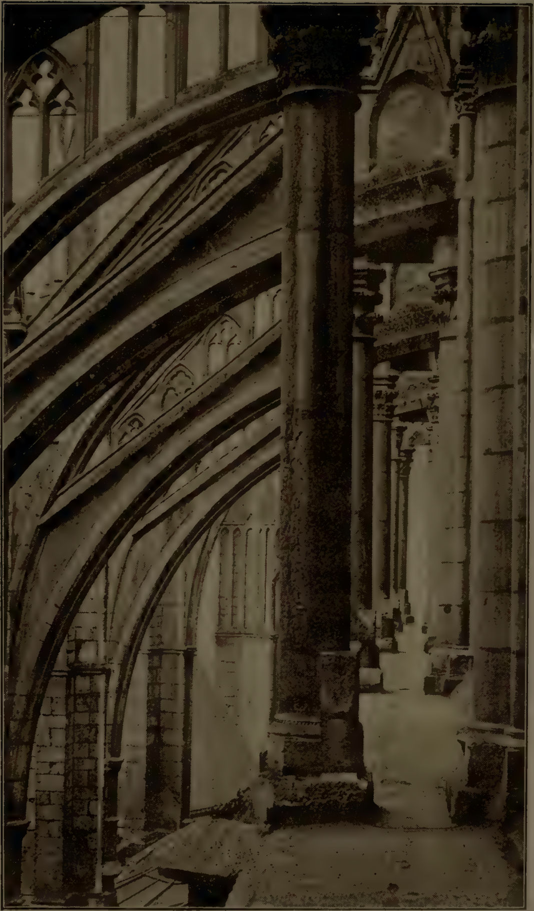


Photo. by H. T. Edwards.

Amiens. Flying Buttresses of Choir.

CHAPTER XIX.

Mouldings.

At first sight the study of the moulding profiles of our mediæval art may seem a somewhat forbidding subject, owing to the elaboration of these and the similarity, broadly speaking, of many forms employed. To the beginner they almost seem to defy analysis. Yet it is comparatively easy to obtain a working knowledge of the principal profiles which may serve as a basis for further and more detailed study.

It is therefore the object of this chapter to treat of the broad differences and evolutionary development of mouldings, describing and enumerating the chief individual forms and the successive variations these underwent.

For these are of primary import as evidence determining the period of this or that portion of a building. However closely the subsequent completion of an earlier structure may have intentionally been kept in harmony with the ordinance of parts as first set out, the profiles of the mouldings are always those in common use at the actual time of the execution of the work, *e. g.*, as at the naves of Westminster Abbey or Beverley Minster.

Despite, then, its apparent subtlety and complexity, the subject is not so difficult if the first principles are thoroughly grasped. So, as before, we begin from elementary constructive requirements.

We have seen how the mediæval builders seized every opportunity to practise sage economy, both in the use of material and by the avoidance of all unnecessary expense in preliminary works of a temporary character, centering, and the like. Hence the introduction of the "*sub-arch*" (see page 326), valuable alike for the economy of material it permitted and for the simple elaboration it imparted to the arches, doors, and windows so constructed.

These arches often remained square-edged above the *impost* or *springing* (see pages 3, 4), while the vertical piers or the jambs of the opening were enriched with angle or nook shafts supporting the arch "*orders*" above.

In the case of Romanesque doorways, etc., the square-edged voussoirs (Figs. 84, 90) were often decorated with flattish carving (Plate I), but early it became desirable to enrich arches by some simple method in cases where such foliaged ornament was inappropriate, or where circumstances did not permit of its use.

Hence the cutting away or *chamfering* (Fig. 370, A, B), of the projecting angle or arris (Fountains nave, Fig. 120), a most obvious means of obtaining a certain amount of lightness and contrast.

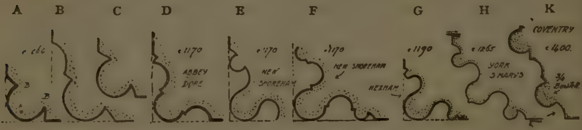


FIG. 368.—Bowtell or Edge Roll.

The chamfered or splayed arch was largely used throughout the various periods in parish church work, and the supporting pier is simply cylindrical or polygonal.

Romanesque Profiles.—But the step destined to produce the complex profiles of the succeeding periods was the substitution of an "*edge roll*" for the sharp square *arris*. (Fig. 368.)

This latter was rounded off, as at A, and small V-shaped channels sunk a little way back at B B (Fig. 370, C), producing a "*three-quarter roll*" or "*bowtell.*"

Further enrichment was obtained by sinking flattish hollows and V-shaped incisions. The chief varieties of Anglo-Norman mouldings are shown in combination in Fig. 87.

It will be seen that there is in these a certain amount of surfacing and economical character, arising not from any desire to spare labour, but from limitations of technical capacity to execute. Nevertheless, with such simple means very rich effects were achieved, and as the skill of the mason increased, so likewise did the profiles develop, with emphasised accent and heightening of contrast.

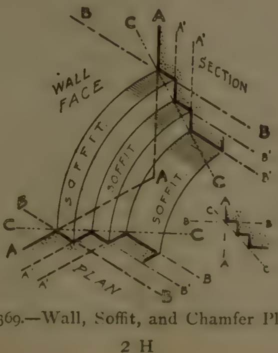


FIG. 369.—Wall, Soffit, and Chamfer Planes.

It will be seen that the early mouldings, shallow and surfaced, follow closely the planes of the original squared stone block before it was thus wrought (Fig. 84), preserving the rectangular grouping of the *arch orders*.

Arch mouldings are contained within these three *planes* (Fig. 369):—

A A The "*wall plane*," parallel to the wall surface.

B B The "*soffit plane*," parallel to the underside or the "*soffit*" of the arch, and at right angles to A A.

C C The "*chamfer plane*," generally inclined at an angle of 45° (forty-five degrees), or half a right angle to planes A A or B B.

It is important for the student to bear this in mind in studying mouldings, and this is especially useful in sketching the profiles or sections. First set up the rectangles representing the original squared surfaces of the unmoulded arch stones, and the profiles are inscribed therein. (See also Figs. 133, 157.)

A comparison of examples will demonstrate the fact that the multiplication of mouldings results in obscuring the defined rectangularity of the receding arch orders, tending to conceal the wall and soffit planes while emphasising the diagonal chamfer plane.

Consequently, on analysis, we find that during the Romanesque, Transitional, and early-XIIIth century, mouldings lie along the wall and soffit planes; in Geometrical and Decorated the chamfer plane is employed in addition, while in Perpendicular the chamfer plane is used alone as the basis of setting out. (Compare Figs. 188, 219, 249.)

Transitional Mouldings.—The tendency of the later Cluniac Romanesque (see Chapter IV) lay hardly in the direct line of progressive profiling, with its elaboration of redundant ornament, and repetition of zig-zagged and fretted rolls, and channellings.

Cistercian influence, with its zeal for simplification of structure (page 146, *et seq.*), swiftly changed all this.

The mouldings soon show variety of contour; undercutting and accentuation develop, the hollows deepen, light and shadow are vividly contrasted; all of which innovations may be studied in contemporary profiling. Coming to the individual members employed in the composition of these, the introduction of the *pointed bowtell* (Fig. 374, A) should be noted, which was in great favour in the North of England at this time. It comes into use about the same time as the pointed arch, and it will be seen to be lighter in character, and its projection is greater than usual in the earlier type of "*edge roll*" which now begins to stand forward with the deepening of the side hollows (Figs. 368, 370, C, D, E).

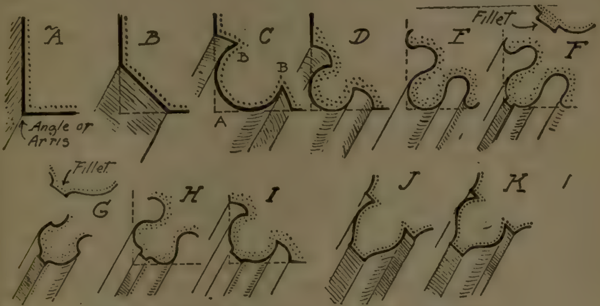


FIG. 370.—The Edge Roll and the Roll and Fillet.

The next modification met with is important, as being the parent type of most of the later varieties of roll mouldings.

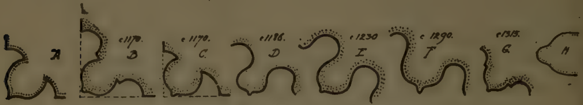


FIG. 371.—Keel Mould and Ridged Roll.

This is the "*roll and fillet*," formed by the addition of a narrow rib or flat fillet to the edge roll, as in Fig. 370, F. This was largely employed by the South Eastern School of our Early Gothic. At first, the fillet is set square on the bowtell (Fig. 373, A), but later, the junction is effected by a slight curve (Fig. 370, G, H).

The edge roll and pointed bowtell in Transitional work often stand forward with a narrow fillet on each side, between the moulding and the flanking hollows, as in Figs. 133, 368, B, D, F; 374, B.

Another variant, the *keel mould*, so called from its fancied resemblance to the cross section of a ship, and developed from the pointed bowtell by working a depression on each side close to the apex. (Fig. 371, A, B.)

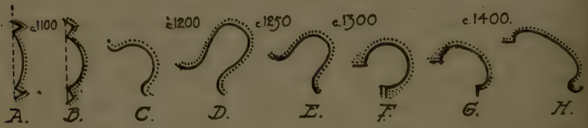


FIG. 372.—Evolution of the Hollow.

Whereas the Anglo-Norman hollow was but a shallow segment of a circle, that of the Transitional period often approaches a semicircle in section; in the more advanced examples it becomes deeper and foreshadows the undercut contour of the early-XIIIth-century manner (Figs. 133, 368), Abbey Dore; New Shoreham.

The V-shaped incisions first widen and then are discarded, while two segments of circles combined as in Fig. 374, B, Selby, are often met with.

This progressive development of roll moulding and contrasted hollow results in the multiplication of the members composing a profile, and by consequence, the individual rolls become lighter and smaller; notably in the West of England School is this early tendency to minute subdivision apparent.

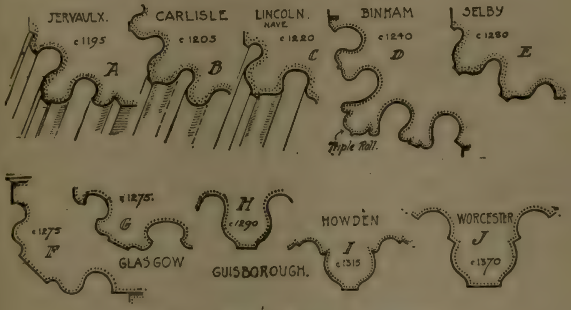


FIG. 373.—Roll and Fillet Mouldings.

Early English or Lancet Profiles.—The result of the experiments of the later XIIth century is seen in the aspect of profiles after 1200 (Fig. 157). These become sheaves of roll mouldings, a series of alternate bold projections and deeply cut recessed hollows (Fig. 372, D), the contours of which are daringly undercut, somewhat pear-shaped in form, and irregular in character. *Each principal roll is separated from the next by a hollow.* (Fig. 376, A, B.)

Individually analysed, the principal varieties employed in this prodigal luxuriance are :—

(1) *Edge roll* or *bowtell.* (Figs. 368, G ; 370, E ; 376, A.)

(2) *Roll and fillet.* (Figs. 370, F, G, H ; 373, A, B.)

(3) *Pointed bowtell.* (Fig. 374, D.)

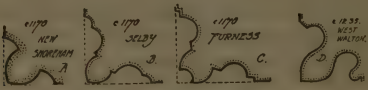


FIG. 374.—Pointed Bowtell.

(4) *Ridged roll.* (Fig. 371, D, E.)

All these are of remarkable variety of contour. Sometimes (1) the Edge roll and (2) Pointed bowtell have a channel or slight hollow sunk at the apex.

(5) *Triple roll.* A compound moulding of three rolls (usually pointed), grouped like a Fleur-de-lys, often occurs in the projecting angles between the jamb shafts of doors, but is sometimes met with in arch mouldings. (Fig. 375, A, B, C.)

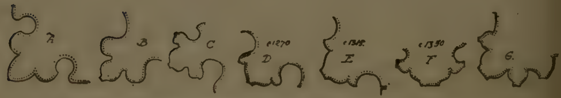


FIG. 375.—Development of the Triple Roll Moulding.

(6) Various angular and curved horn-like projections, fillets, etc.

The above are separated by—

(7) *Deeply cut hollows.* The curving outline of roll and hollow is generally continuous, but sometimes these may meet abruptly. (Fig. 157, Salisbury; 376, Worcester.)

The following are less common in lancet work—

(8) *Scroll mould.* (Fig. 378, B.)

(9) *Roll and triple fillet.* (Fig. 377, A.)

Mouldings of the Geometrical Period.—These closely resemble in many respects those of the earlier part of the XIIIth century, but the difference in aspect becomes more marked as the XIVth century approaches.

There are, however, certain distinct characteristics to be noted and looked for; (*a*) the profiles become more regular and geometrically precise in their contour; (*b*) a large use is made of segments of circles to form the principal curves employed; (*c*) the hollows are larger, and when not three-quarters of a circle in outline (Fig. 372, E, F), are less undercut, more open, and *undulating* in contour. Guisborough, Selby. (Figs. 188, 376, C, D.)

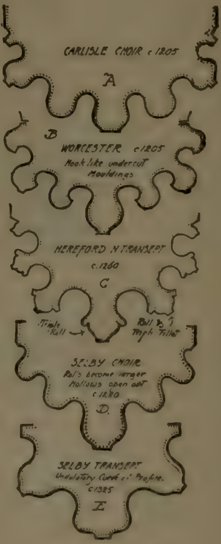


FIG. 376.—Roll Mouldings and Hollows.

The principal varieties employed are :—

(1) *Roll and fillet.* (Fig. 373, E, F, G, H.)

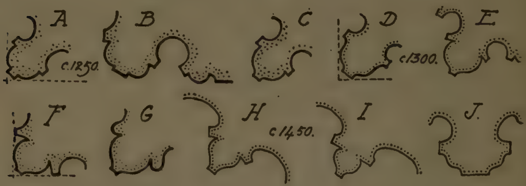


FIG. 377.—Evolution of the Roll and Triple Fillet.

(2) *Roll and triple fillet.* (Fig. 377, A, B.) This though appearing earlier, is now largely employed, and is formed by the addition of two lateral fillets to (1).

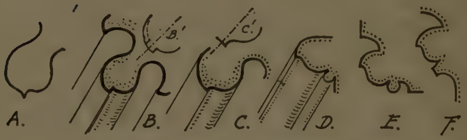


FIG. 378.—Scroll Moulding and Ogee.

(3) *Scroll mould*, so named from its resemblance to a roll of paper with the overlapping edge showing (Fig. 378, B). This is seemingly derived either from a roll and fillet with one side left uncut (Fig. 378, B′), or possibly from the pointed bowtell or keel-mould of irregular contour. (Fig. 378, A.) This moulding is a distinctive mark of the period in abaci strings and base moulds. (Figs. 158, 386, 387, 388.)

(4) *Ogee roll.* In this the squared projecting edge of the scroll mould is softened off into a curve, as was done to the roll and fillet. (Figs. 378, C, C′; 379, A, B.)

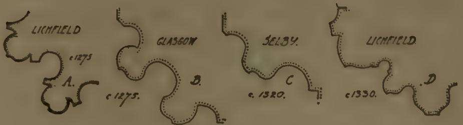


FIG. 379.—Ogee Roll.

(5) *Quarter round* or *Ovolo.* In jamb and arch moulds it appears as in Fig. 382, L, and may be derived from the half of a triple roll and fillet. In bases it is used as the lower member of a double or triple roll base. (Fig. 387, (21), (23).)

(6) *Chamfers*, in their several varieties, now come into use, the favourite form being the *hollow chamfer* or cavetto, formed of a quadrant of a circle. (Fig. 382, D.)

(7) *Hollows.* The character of these is as indicated above, and they are used rather less plentifully than before. The *three-quarter hollow*, used in the re-entering angle and joint between two adjacent arch orders now comes into use, to simplify under-cutting (Fig. 188); sunk in the wall-surface beneath a hood-moulding of an arch (Fig. 388, (26), (27)), it is a mark of work, *c. temp.* Edwards I and II.

Mouldings of the Decorated Period.—These are notable for the recurrent use of the ogee profile, probably, as we have seen, derived from and suggested by the reversed curve used in the roll and fillet, and in harmony with the extensive employment of sinuous outline in tracery and foliage, etc. (Page 246, *et seq.*)

When the ogee first appears (as in Figs. 378, 380), the return concave curve is small and unimportant, the convex portion large, rotund, and predominates. In time the relative proportion of the component curves changes and is more equally divided, with a rather flatter outline.

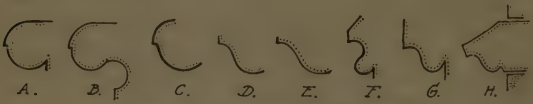


FIG. 380.—Evolution of the Ogee.

The rolls become large and bulky, and the several varieties of chamfer are pressed into service. At the same time, the hollows are yet more sparingly employed and now separate the arch orders or *groups* of mouldings instead of *individual* members. These latter, instead of being fairly uniform in size, vary in this as well as in form and kind.

Consequently, a feeling for breadth of modelled surface and graduated tones has superseded the incisive alternation and contrast of light on dark, characteristic of the XIIIth-century ideal.

The chief varieties of mouldings customarily met with are these:—

(1) *Roll and fillet.* Now much wider at the base and of ogee profile, it may be rotund in section (Figs. 219, B; 370, 1; 373, 1); or broad (Fig. 381, Winchelsea).

(2) *Ogee.* (Fig. 380, C, D.) The special mark of the period in abaci (Fig. 386, (17)), astragals, base-moulds, and strings.

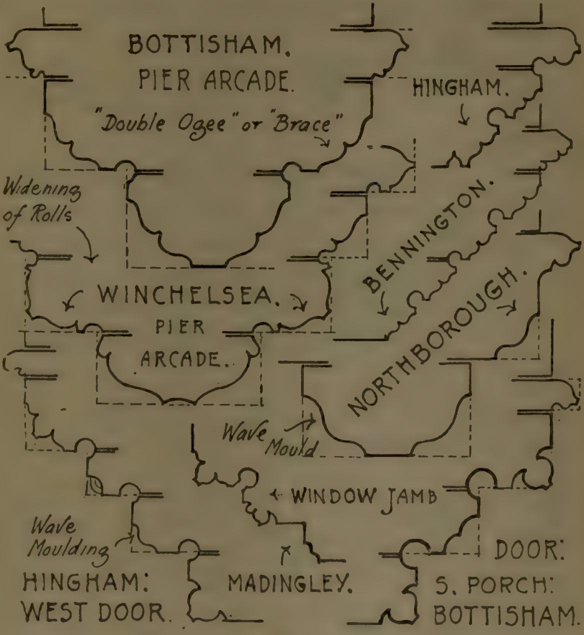


FIG. 381.—Decorated Mouldings.

(3) *Ogee Roll* is now broad and undulating. (Fig. 379, C, D.)

(4) *Double ogee*, *Brace*, *Bracket* or *Double ressant.* (Fig. 382, K.) Usually small and delicate. (Fig. 381.)

(5) *Roll and triple fillet* assumes the form in Fig. 377, E, F.

(6) *Triple roll* is modified, as in Fig. 375, E.

All the above are derivatives of the Roll and fillet of Lancet use.

(7) *Quarter round* or ovolo, in jambs, as Fig. 382, L, in bases, as Fig. 387 (24), (33).

Chamfers.

(8) *Plain chamfer* or splay. (Fig. 382, A, G.)

(9) *Sunk chamfer.* (Fig. 382, B.)

(10) *Hollow chamfer* or *cavetto.* (Fig. 382, D.)

(11) *Wave mould* (Fig. 382, M, N, O), derived from the quarter round by substituting a slight curve for the sharp re-entering angles of Fig. 382, L.

Nos. 8, 9, 10 and 11, are often used in series or alternating with each other separated by hollows, as in Figs. 381, Bennington; 382, H, I, J.

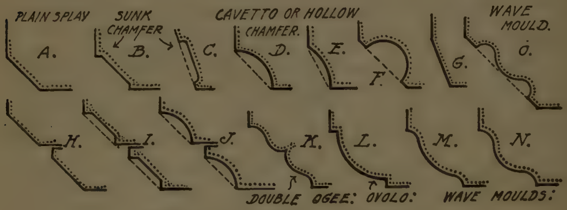


FIG. 382.—Splays and Chamfers.

(12) *Hollows.* Normally now three-quarters of a circle in profile, a mark of the period, is the manner in which these are employed

in the re-entering angles between each arch order (Fig. 381, Hingham; Winchelsea); if used in soffit plane, these may be semicircular.

Minor recurrent combinations are the *ogee and roll* (Fig. 378, D) met with in strings and abaci, etc.; the *ogee and fillet* (Fig. 378, F) is used in the bell mouldings of capitals, etc.

Perpendicular profiles. These are distinguished by their relatively shallow depth, arranged closely on the chamfer plane. Usually, the individual members are rather large and coarse, few in number, hard as to their lines and edges, and withal there is a certain thin meagreness and lack of contrast compared with the vivid effects, rich fulness, and rounded softness of XIIIth- and XIVth-century profiling.

As in the Romanesque, now with the use of the chamfer plane, the mouldings are sunk but little below the original splayed surface of the stone; thus, a complex profile is oft obtained with the minimum trouble, a change from the laborious undercutting and surface modelling we have been surveying in earlier periods. The distinction of the arch orders is now largely lost owing to the increasing emphasis of the chamfer plane. Many of the members of a profile of an arch or door are continuous, and descend below the impost level, running down the sides of jamb or pier, and are stopped on a plain splay. (Fig. 326.)

The chief mouldings in use during this period are:—

(1) *Bowtell.* This comes back into favour; its presence and character is a special mark of the style. It assumes the form as in Fig. 368, K, with a section of three-quarters

of a circle, and is often of "bead"-like aspect. (A "bead" is a small half- or three-quarter round moulding.) In jambs and piers, etc., the bowtell is treated sometimes as a diminutive shaft, and receives a cap and base accordingly.

(2) *Roll and fillet.* Now rarely employed, and its disuse is as notable a mark of the period as is the employment of the bowtell. Its form, however, has undergone a great change, and is usually either blunted in appearance (Fig. 373, J), or lean and wiry (Fig. 370, K).

(3) *Keel mould*, in a debased form, is often used in strings, astragals and abaci. (Figs. 249, H; 371, H; 383, J.)

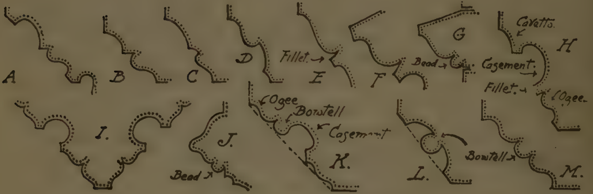


FIG. 383.—Some Perpendicular Compound Mouldings.

(4) *Roll and triple fillet.*—Rarely occurs, and even when met with is hardly recognisable as the descendant of the earlier type. (Fig. 377, I, J.)

(5) *Hollow chamfer.* Sometimes a quadrant of a circle in profile, but is usually flatter. (Fig. 382, D, E.)

(6) *Ogee.* The repeated use of this moulding alone or in various combination is to be noted, but its profile is very different from that of its Decorated prototype of ogee. It is now much larger, with coarse boldness of line, usually flatter, the concave portion equals, if not exceeds, that of the convex curve. Frequently the ogee assumes an S-like contour (Fig. 380, F, G, H); in base moulds it becomes bell-shaped (Fig. 387, (34) to (37).)

(7) *Double ogee.* This in Decorated work was relatively small and delicate; it now becomes coarse, especially in arch mouldings, and may be unsymmetrical. The combination (Fig. 383, I), may be regarded as two double ogees grouped together at right angles, or as a later form of "triple-roll" moulding.

(8) *The casement or hollow.* The character of this is distinctive. In early work it is similar to the Decorated three-quarter hollow, but becomes ever wider and more shallow as time goes on towards the XVIth century. The method of its use should also be noted; it is very prominent, usually occupying the centre of a group composing a suite of mouldings, often being as wide as one-third of the total width of profile. (Figs. 249, F; 372, (G), (H).)

The recurrent employment of the bowtell, ogee, and casement, is the special mark of Perpendicular profiles. Some combinations of mouldings to be met with continually are the *ogee and fillet* (Fig. 383, E, F), *ogee and bead* (Fig. 383, G), *ogee and cavetto* (Fig. 383, A, B, C, D), *bowtell and double ogee* (Fig. 383, M), *ogee, bowtell, and casement* (Fig. 383, K).

MOULDED CAPITALS, BASES, AND STRINGS.

A fully-developed capital consists of three parts (Fig. 384)—the *abacus*, the *bell*, and the *necking* or astragal.

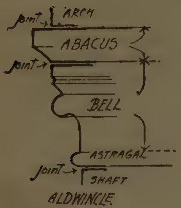


FIG. 384.
Type of Capital.

Its functional purpose is to receive the superincumbent loads from the walls, arches, or vaults which it supports, and transmit these to the pier or shaft below, the latter being made as slender as possible and of the minimum area deemed commensurate with stability.

A single capital may thus have to support several converging arches or vault ribs; consequently, in order to find sufficient area for these, the upper member or abacus overhangs the face of shaft beneath.

Decoratively, the value of the capital is to arrange, in an easy manner, the transition from the plan form above the abacus, at the springing of the arch, to that of the supporting pier, column, or shaft: this is effected by the *bell* or middle portion, which is separated from the vertical face of the pier by the astragal.

In principle, during Romanesque, this transition, from square arch order above to circular shaft below, was managed by interposing an inverted hemisphere or cone (Figs. 41, 42, 77), the outline of the cap being thus roughly *convex*. During the Transition, the bell becomes *concave*, and correspondingly lighter in appearance, such being the normal type of Gothic moulded caps. (Figs. 123, 124, 186.)

The Abacus.—In its simplest form the abacus was a plain square block. In Romanesque the heavy aspect of this was lightened, as at Lastingham (Fig. 77), by splaying off the lower edge. Next a V-shaped channel was added above (Figs. 79, 110), and the upper plain face still further reduced in extent; then the chamfered splay gives place to a shallow hollow; later still the upper or lower edge, or both, may terminate in a small bead or roll (Fig. 158). Such is the common type during the Transitional period.

Till the end of the XIIth century the upper edge of the abacus was *square* (Fig. 386, (1) to (5)); the next important step was the *rounding* of this arris. Then by deepening the cavetto we obtain the normal pattern of *undercut* XIIIth-century abacus, with its hollow set between the upper and lower roll (Figs. 158, 186), the most common types of which are given in Fig. 386, (7), (8), (9), (10).

During the Geometrical period, the scroll moulding (Fig. 380, A, B), may take the place of the roll, roll

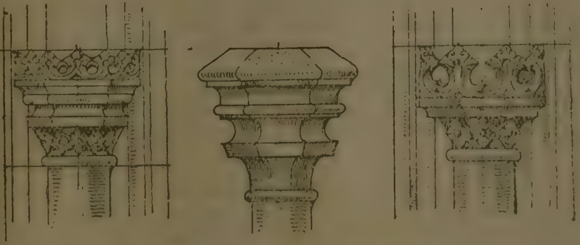


FIG. 385.—Perpendicular Caps. Lavenham.

and fillet, or variant of such. In Fig. 386 (12) is shown a significant type common at this time, especially in Northamptonshire and neighbourhood. For in Decorated we find the undercut hollow suppressed, and the early-XIVth-century abacus is distinctive, the ogee and bead forming the profile. (Figs. 158, 386, (16), (17).)

Next, in Perpendicular, the *rounded* upper edge gives way to a chamfer, sometimes battlemented or crested (Fig. 385), beneath which is usually an **S**-shaped ogee. Alternatively, the debased keel moulding, or some corrupted form of the Decorated abacus, may be met with. (Fig. 386, (21), (22), (26).)

The Bell.—Beneath the overhanging abacus, and separated from it usually by a small vertical face or fillet, comes the bell of the capital. In XIIIth- and early-XIVth-century work this is profiled with some variant of the roll and fillet. (Fig. 386, (10), (14), (15), (17).)

REFERENCES TO FIG. 386:—

CAPITALS.

(1) St. Peter's, Northampton.
(1A) Whaplode (abacus).
(2) Fountains nave.
(2A) Moulton (abacus).
(3) Warmington.
(3A) Aswarby (abacus).
(4) Deeping St. James.
(5) Byland nave.
(6) St. Sepulchre, Northampton.
(6A) Fulbeck (abacus).
(7) Wenlock.
(8) Whitby.
(9) Fountains.
(10) Wawne.
(11) Market Deeping.
(12) Northborough.
(13) Salisbury cloister (undercut scroll mould).
(14) Tintern (double-moulded bell).
(15) Polebrook (undercut ogee).
(16) Rushden (double-moulded bell).
(17) Typical Decorated cap, Heckington.
(18) Stamford St. Martin.
(19) Long Melford.
(20) Bocking.
(21) Beverley St. Mary.
(22) Whiston.
(23) Beddington.
(24) Parham.
(25) Preston.
(26) Great Bromley.

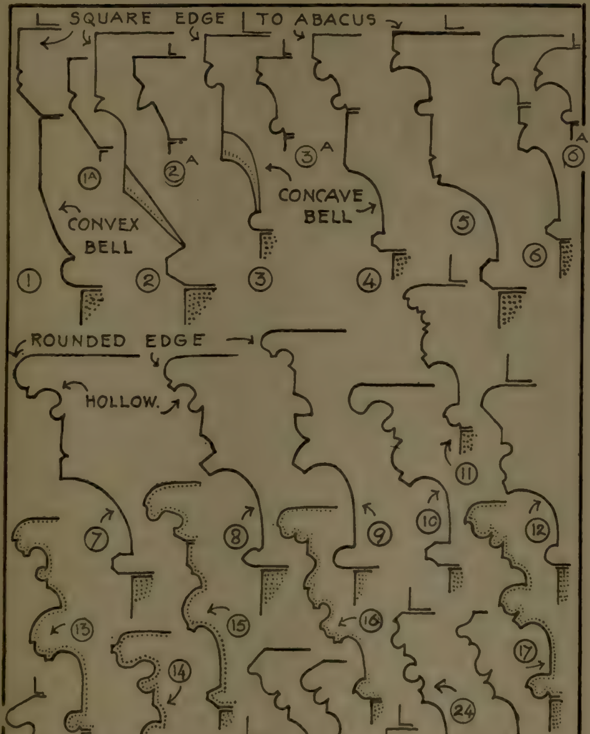


FIG. 386.—Evolution of the Capital.

In Early English examples the bell may be doubly moulded, but this is more rare during the Decorated period (Fig. 386, (14), (16),) the caps of which have considerably less spread than during the earlier period, and are also less undercut.

The distinction between abacus and the moulding of the bell is largely lost in Perpendicular, the caps exhibiting a singular variety of profile, and the component members are fewer in number.

Plan of Caps.—In Anglo-Norman this was rectangular, and normally so during the Transition, but the early adoption of a *circular* plan form of abacus strikingly differentiated our Early English Gothic from that of the Continent. This remained the standard pattern onwards till during the Decorated period, when the *octagonal* abacus alternatively came into favour, finally ousting the earlier type and becoming the accepted Perpendicular form, though it should be noted that in these caps the bell mouldings, if sufficiently distinct from the abacus, may sometimes be circular on plan, as in like manner the upper mouldings of the bases follow the outline of the shaft, the plinths remaining polygonal. (Figs. 214, 215.) Sometimes these late abaci have concave sides, *e.g.*, Canterbury, St. Alphege; Colchester, All Saints.

Also in buildings of a parochial character the piers were often simply cylindrical or octagonal, so therefore does the plan of the cap correspond; to determine the exact period, a careful examination of the mouldings is necessary.

The Astragal or Neck Moulding.—In Anglo-Norman this member is usually a half-round, bold and coarse, Fig. 386, (1); during the Transition the half-hexagon comes into general use as well. (Fig. 386, (2), (6).)

In Lancet work the necking is lighter, though still bold; if of semicircular section it is stilted forward (Fig. 386, (9)); the pointed bowtell and half-hexagon are also common. (Fig. 386, (8), (10).) During the Geometrical period, in addition to the half-round, the scroll mould and ogee, may also be met with (Fig. 380, A, C), the latter being the special mark of Decorated. (Fig. 386, (17).) The astragal of Perpendicular is either a plain round, the debased keel mould, or an ogee with the upper surface chamfered off. (Fig. 386, (18), (20), (21).)

Summary.—The evolutionary development of the capital is thus traced on page 479:—(1) shows the Anglo-Norman type with convex bell and heavy abacus; (1A), (2), (2A), manifest an increase in the projection and a lightening of the aspect of the abacus; while in (3) and (4) we find the concave bell achieved. (See also Figs 123, 124, page 166.) In (5), (6), (6A), the last traces of archaism are discarded, leading on to the fully developed "Lancet" types shown at (7), (8), (9), (10). From these we pass on to the Geometrical examples—(11), (12), (13), (14), (15), while it is an easy transition to the typical Decorated type of (17). The Perpendicular examples show the modification of the earlier types. (Compare for example (10) and (18); (8) and (20); (17) and (21), (22), (23). The angularity of these later examples, (18) to (25), is in marked contrast to the sweetness of curve displayed by the earlier profiles.)

Bases and Base moulds.—The function of the base is to distribute the load of wall or pier over an adequately sufficient area of ground. Æsthetically, at the same time, this spreading of the base satisfies the eye as to the stability of the structure, the horizontal lines contrasting with the vertical lines and planes above.

Romanesque bases are of undeveloped character and simple in aspect, a rectangular plinth, above which may be one or two unimportant mouldings running around the lower extremity of the pier or shaft, generally consisting of a half or quarter round with perhaps a flattish hollow above. (See Figs. 79, 80, 81; 387, (2) to (6).)

The projecting angles of a square or octagonal plinth are often carved with a spur-like ornament, called a griffe, filling up the space unoccupied by the shaft (Fig. 82).

During the Transitional period, or perhaps a little before, decorative attention was turned to the base, which previously had seemingly been much neglected, and we meet a new form, apparently derived from the "Attic Base" of classic antiquity, which was composed of a square plinth supporting a hollow or scotia, and two fillets placed between an upper and lower roll. (Fig. 387, (1).)

The new form appears at Canterbury, Peterborough, and elsewhere, and by deepening the hollow downwards we obtain the typical "water-holding base," so called from its sunk channel (C, Fig. 387, (10), (14), (15)), which comes into almost exclusive use from *c.* 1150 on till *c.* 1260. (Fig. 186.)

The difference between the Transitional and Lancet water-holding base is that in the former the lower roll is usually depressed, *c.* 1155 till *c.* 1190. (Fig. 387, (13), (13A).)

If we now omit the hollow and bring the rolls close together, or, as is sometimes done, a square member, X, is interposed (Fig. 387, (16)), we come to the "double" or "triple roll" base, the favourite type of the Geometrical period, which lasted, with certain modifications, well into the XIVth century, as at Bottisham. (Fig. 186, (s).)

It should, however, be noted that in the Lancet work the plinth and lower roll are usually flush—*i.e.*, the latter is worked out of the same block as the former by means of a hollow. (H, Fig. 387, (20), (21).) In Geometrical work the roll may instead oversail the vertical face of the plinth. (Fig. 387, (19), (22).)

In the Decorated period the triple roll base becomes flatter and projects less and begins to rise in height (Fig. 186, S, T, U, V), often oversailing the plinth with *flat* under-side, *e.g.*, Fig. 387, (23), (24). The rolls are bigger, ogee curves are introduced, and often one of the rolls is *depressed* inwards in a *wave-like* contour, as at X, Fig. 387, (26), (27), (33).

From these it is an easy development to the Perpendicular base, with one or more *bell*-shaped ogee mouldings resting on a roll or *cushion*-like member and raised on a lofty plinth. (Fig. 387, (34) to (37).)

The Plinth.—The Norman plinth was, as we have noted, low and rectangular. In Early English we find the superfluous angles cut away, and the plan of plinth becomes octagonal. The increasing spread of the bases now occupying too much floor space, during the Geometrical period, the plinth therefore becomes concentric, following the outline of the pier. (Fig. 141.) Then when the spread of bases is reduced and they begin to rise in height, we find in Decorated and Perpendicular work the plinth polygonal in plan once more. This stilting of the bases goes steadily on, till in the XVth and XVIth centuries the projection of the base-moulds is reduced to a minimum, but to compensate for this they are arranged in lofty tiers. This probably arose from the introduction of fixed seating in the churches. (Figs. 186, 249.)

In like manner do the base mouldings to walls develop.

Strings and Hood Mould.—The function of these is to throw off the rain from the wall-face, arch and opening; consequently they constructionally require the upper surface to be sloped or "weathered," while the under-side required to be "throated" (Fig. 388, (17), (27), (35), (42),) so as to cause the rain to drip clear, instead of running down and staining the masonry. Nevertheless these requirements are not always complied with.

Decoratively, the string-course was of great value, as marking off the different stories or stages of a building, and at the same time, like the base courses and the parapet, tying together horizontally the component portions of a building which the strong vertical lines of buttresses, pinnacles and piers, tended to render disconnected.

References to Fig. 387 :—

Base-moulds.

(1) "Attic" base (classic).
A Upper roll
B Lower roll
C Scotia or hollow } Circular on plan.
D Square plinth.
(2) Winchester.
(3) Malvern.
(4) Canterbury (Ernulf).
(5), (6) Stamford St. Leonards.
(7) Tansor.
(8) Fountains.
(9) Buildwas.
(10), (11) Whaplode.
(12) Wellingborough.
(13) Horbling.
(13A) Stamford St. Leonards. } Depressed lower roll.
(14) Kirkstall.
(15) Wenlock.
(16) Rievaulx.
(17) Threckingham.
(18) York, St. Mary's.
(19) Tintern.
(20), (21), (22), (23), Double-roll bases.
(24) Helpringham.
(25) Threckingham.
(26) Wells, chapter-house.
(27) Ely, Lady chapel.
(28) Austin Friars, London.
(29) Winchelsea.
(30) New Walsingham.
(31) Saxtead.
(32) Holbeach.
(33) Billingborough.
(34) Louth.
(35) Arundel.
(37) Beverley, St. Mary's.

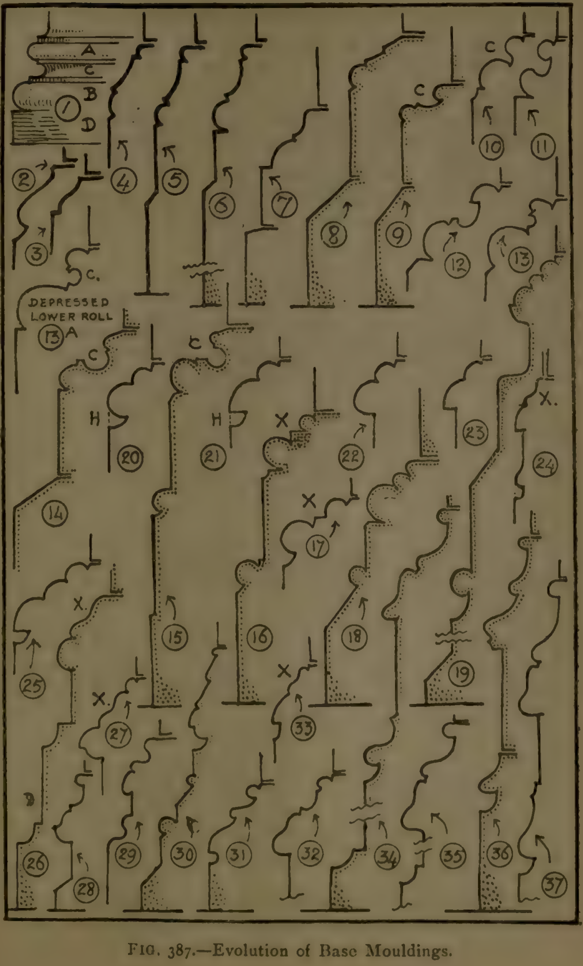


FIG. 387.—Evolution of Base Mouldings.

Till the mid-XIIIth century, the string-course was made much use of; after then, owing to the reduction of wall space by window enlargement, it becomes less important.

Strings and hood-moulds are often similar in profile, for the latter was often continued horizontally along the wall, so likewise was the moulding of the abacus often extended as a string. Consequently the profiles of all three bear mutual resemblance.

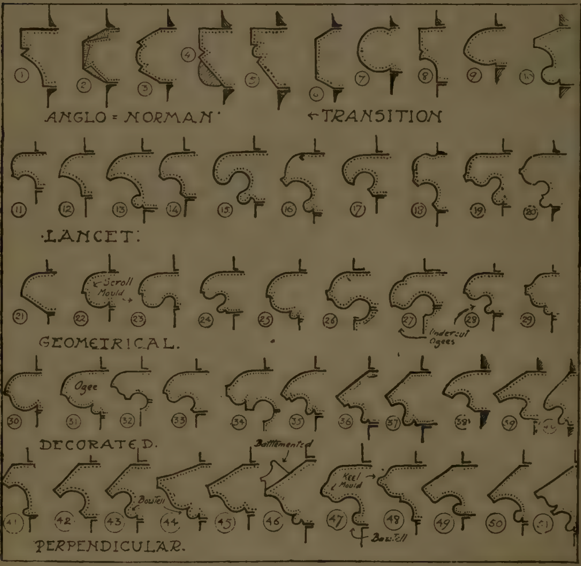


FIG. 388.—Strings and Hood moulds.

Norman and Transitional strings are massive, wide, and of shallow projection, usually flat-topped when not semi-hexagonal in section, their profiles closely resembling in aspect those used for abaci. Towards 1200, as in abaci, the upper surface becomes *rounded* and the lower portion *undercut*, and the string begins to project more and is less in height.

The most usual Lancet and Geometrical forms are given in Fig. 388, (11) to (29). In Decorated work the undercut hollow becomes less prominent and the upper surface is often sloped back instead of being rounded (Fig. 388, (30) to (40),) leading on to the chamfered upper side typical of Perpendicular. These latter are somewhat angular in aspect with an ogee, a quarter- or half-circle sunk in the under-side with usually a small bowtell running along the lower edge. (Fig. 388, (41) to (51).)

CHAPTER XX

Parish Churches.

We have now briefly sketched the course of English Mediæval Architecture in scarcely more than outline. Does the subject interest and invite further study? If so, how may the information already acquired be turned to account? We should endeavour to apply our knowledge and by so doing extend it.

During the Middle Ages the cathedrals and churches were the people's picture books, libraries, art galleries, their æsthetic and religious all in all; but the coming of the printed page, the shameless and wholesale plunder of parish churches and their property under Edward VI, and the destruction and mutilation of these "Stone Books" (for the mediæval churches may be regarded as such), diverted popular interest from their care and study.

To many a mediæval church or cathedral is but "a building"! What it is desired to insist on is that these are infinitely more than merely that; they represent to us the hopes, aims, customs, practices, and ideals of a past age in a materialised form—the result of the combined efforts of past generations, intimately related to the historical development of the nation.

Regarded thus, do not these structures appeal to us far more as the visible embodiment of the ideals of long ago than simply as a fabric which relies on its mere age or beauty to command our respect or admiration?

Now, the cathedrals and abbeys are comparatively few in number and well known. They have their guides, historians, and custodians.

But scattered up and down the length and breadth of England, often with no one to direct attention to them, are the Parish Churches, the glory of the country; not erected as the appanage of a class, or the private property of a corporate body, be it monastic community or secular ecclesiastic, but the very heritage of the people themselves, built, furnished, adorned, and endowed by and for the parishioners who worshipped there.

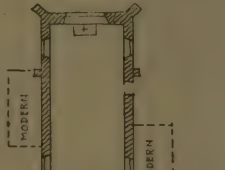


FIG. 389.
Rougham, Suffolk.
XIVth century.

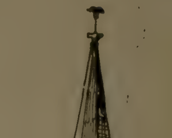


FIG. 390.—Southam.
Broach Spire, with
Pinnacles.

Of all kinds and descriptions are these buildings, from the humble wayside shrine to the town church of almost cathedral magnificence and importance.

Having first become conversant with the course of Gothic art, it is to these, then, that the writer would suggest that attentive study should be directed. Many may be unable to visit the greater triumphs of mediæval art, but there are few who do not come in contact with the parish church in daily life. And in making excursions on foot, by train or cycle, it does add immeasurably to one's interest to have such an objective in view. When visiting these lesser buildings, often there is no one available who really knows or cares much about the details and history of the church. We, therefore, must be our own guides and explore. And really the zest of searching into the unknown past greatly whets our interest and sharpens our powers of observation.

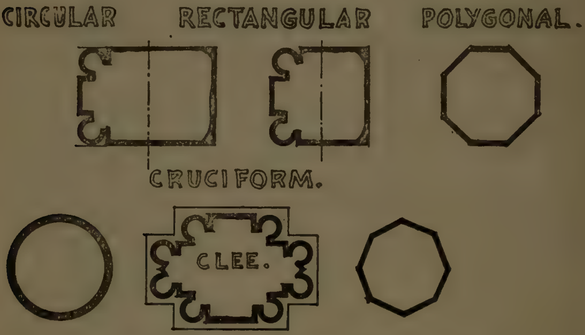


FIG. 391.—Romanesque Parish Church Piers.

In surveying thus some village church and trying to decipher its past history, it must be remembered that, in its present state, it is usually the result of the accretions, alterations (aye, and wanton mutilations!) of years of parochial life. Generally, the mediæval parish church was added to as circumstances required, very rarely was it entirely rebuilt, and that as it was the common property of the parish community and the centre of village life, so it was in continual use. Service was carried on without a break, day by day, year in, year out, and any alteration of the structure had to be executed without interfering with Divine Service. For, till the gilds were sufficiently important and the parish wealthy enough to build a gild hall or church house, in default of other accommodation, all parochial assemblies necessarily took place within the church, whether for the purpose of the government of the community and regulation of its affairs, or even for secular recreation. When these gatherings grew to such importance as to be out of keeping with the sacred purpose of the edifice, such a gild hall became a necessity.

Therefore we see that the parish church was not, in intention, a miniature edition of a cathedral, but a simple type of building in constant use which, by an aggregation of additions or rebuildings, often somewhat approximated to the cathedral or monastic church by these extensions. (Compare Barfreston, Fig. 393, and Burford, Fig. 401, or Figs. 405, 412, and 416.)

The factors in the development of the parish church were these :—

1. The vernacular Anglo-Saxon tradition of type, square-ended with western tower (see Chapter II).
2. Modified by, and reacting on, the Early Norman church building

3. The example of the cruciform-planned cathedral and abbey churches.
4. Structural accretion by chantries and additions.

Planning.—Parish church plans, broadly speaking, may be divided into three principal classes:—

(A) The unaisled Rectangular (Figs. 393, 408);
(B) Cruciform (Fig. 395);
(C) Aisled Rectangular (Figs. 397, 400).

But a closer analysis reveals various intermediate types, the most usual of which are described below. With the exception of Figs. 389, 393, 394, the accompanying plans in this Chapter are drawn to a uniform scale with those on Figs. 15 and 107, for purposes of comparison, and these are hatched to denote the period and approximate date of structure. (See page 71.)

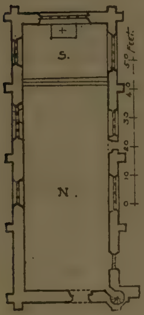


FIG. 392.—Temple Balsal, Warwickshire.

REFERENCES TO PLANS.
CHAPTER XX.

N.—Nave.
A.—Aisle.
C.—Choir space.
S.—Sanctuary.
CH.—Chapel.
T.—Transept.
TR.—Tower.
P.—Porch.

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(1) *Chapel Plan.*

This, the simplest type, is a plain oblong chamber without structural division between nave and chancel other than a low screen, and constitutes a *chapel* rather than a church: such is Skirlaugh. Temple Balsal, Warwickshire (Fig. 392), was built for this purpose by the Knights Templars. St. Etheldreda's, Holborn, was built as the private chapel of the Bishops of Ely.

(2) *Planned with Nave and Chancel.*

(Type: Barfreston, Fig. 393.)

Instead of screening off a portion of the building at the east end, to accommodate the altar and its ministrants, a second chamber, termed the "chancel" or sanctuary, is built out beyond the nave, as at Escomb (Fig. 15), Tangmere (Fig. 406), and opening from it by the "chancel arch." In early churches this was small, but it ever became larger, till at last, in certain examples (class 10), it is omitted, as at Southwold (Fig. 237). The chancel of the parish church corresponds to the choir or eastern limb of the abbey and cathedral, and the name is derived from the term "*cancelli*" or bars, *i. e.*, the screen separating the nave allotted to the laity from the more sacred portion where stood the altar.

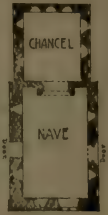


FIG. 393. Barfreston, Kent.

In Anglo-Norman, this eastern annexe, chancel or sanctuary, may be apsidal, as at Copford and Little Tey, Essex, or more commonly, resulting from the vernacular Saxon tradition (see Saxon plans, Fig. 15), be square-ended, as at Barfreston or Adel. In small village churches this simple type of plan provided

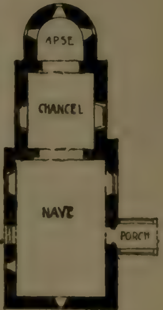


FIG. 394.—Moccas, Herefordshire.

all that was requisite. In many cases, where the XIth- or XIIth-century nave yet remains fairly intact, the chancel has been lengthened or rebuilt later, as at Tangmere, Sussex; Stanningfield, Suffolk.

(3) *Planned with Nave, Chancel, and Sanctuary.*

Types: Moccas, Herefordshire (Fig. 394), without tower; Stewkley (Fig. 65), with axial tower.

The eastern portion is now more important, and the choir space, set apart for the clergy, is expressed in this triple structural divisioning, *e.g.*, East Ham. The sanctuary may be apsed or square-ended. Sometimes an axial tower, as at Dunham Magna (Fig. 15), Stewkley, Cassington or Iffley (Fig. 51), is raised aloft above the choir. Refer also to the plan of Bredon (Fig. 402), showing later extensions. Compare also the later type Morley, St. Botolph's, with western tower. (Fig. 408.)

(4) *Aisleless Cruciform Plan, with Nave, Transepts (Central Tower), and Chancel.*

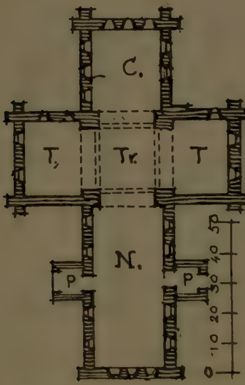


FIG. 395.—Potterne, Wilts.

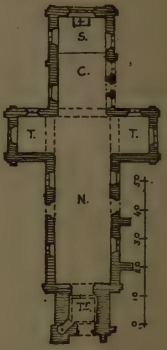


FIG. 396. Achurch, Northants.

As at Potterne. (Fig. 395.) Achurch. (Fig. 396.) This was a very usual pattern of plan in Romanesque, and moreover is one which is recurrent in groups in certain districts, *viz.*, around North Wiltshire, and parts of Berks., Bucks., and Oxfordshire adjacent (Fig. 134); in portions of Essex, Sussex, Dorset, and Somerset, at later periods.

In Saxon work, as at Bradford-on-Avon (Fig. 18), the transept is little more than a porch. At Worth, and formerly at St. Pancras, Canterbury, the feature becomes much more important, yet built as adjuncts and subordinate to the nave. So also in the XIIIth century at Clymping and Achurch. While at Saxon Breamore, Stow (Fig. 22), and Dover (Fig. 15), and in post-Conquest times at Old Shoreham, Potterne, and Shottesbrooke, the transepts are planned around the central tower.

This type of plan, then, may have been built as a complete and fore-ordained scheme, or may have come about when structural extension became desirable, by either adding transeptal chapels to the nave or chancel of class (2), or by adding on transepts to the axial-towered type of class (3), or by pulling down a pre-existing chancel and building up a central tower, transepts, and new chancel beyond; in any case a simpler method of extension than by building on aisles to an existing nave, which involved cutting arcades through the original nave wall.

The foregoing types of plan are most typical in buildings of the Romanesque period, though not invariably so, the naves so far being aisleless.

(5) *Nave with Aisles, Unaisled Chancel* (*normally with Western Tower*).

(Type: Warmington, Fig. 397.)

This is the standard type of Parish Church plan, and comes into general use after 1200, varying in scale and size from the modest dimensions of Little Casterton, Rutland, or Hutton, Essex, to the magnificence of Hingham, Tunstead, Walpole St. Peter's, Boston, and Gedney.

Henceforth the structure of the parish church becomes more ambitious in aim, and an early example of a church thus intentionally planned is that at St. Margaret's-at-Cliffe near Dover, erected during the late XIIth-century, where the western tower again reappears. In many cases, however, this arrangement of plan would seem to have come about by the addition of aisles to classes (2) or (3), and in such cases it should be noted that these added aisles may not be contemporary with each other. At first the aisles were low and narrow, and as time goes on they grow more important, wider and loftier. In some examples they may have span roofs like the nave, and be of practically equal height and width, as at St. Lawrence, Thanet; Rye, Southfleet, Herne. This is also a characteristic arrangement in the West of England, *e.g.*, Kilkhampton; St. Buryan. (See Fig. 398.) (Compare this type of cross section with Figs. 145 and 198.)

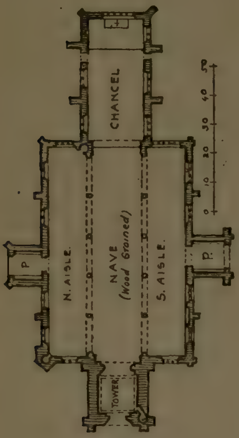


FIG. 397.
Warmington, Northants.

After the end of the XIIth century the chancels begin to notably lengthen, and the distinction between the choir and sanctuary is no longer structurally

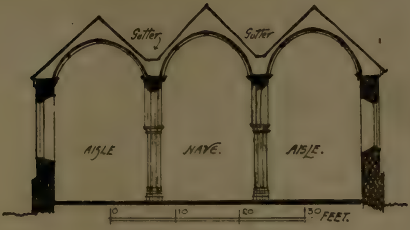


FIG. 398.—St. Buryan, Cornwall.

expressed, except by the raising of the floor of the eastern portion in some examples.

(6) *Cruciform Plan, with Central Tower, Aisled Nave, Transepts, and Unaisled Chancel.*

As at Darlington, Chipstead, Solihull (Fig. 399), Nantwich; and sometimes may have come about by adding aisles to an originally aisleless, cruciform church; but this plan is inspired by the ordinance of the abbey and cathedral.

Patrington, Yorks., is one of the most ambitious examples, with its lofty tower and spire and doubly-aisled transepts.

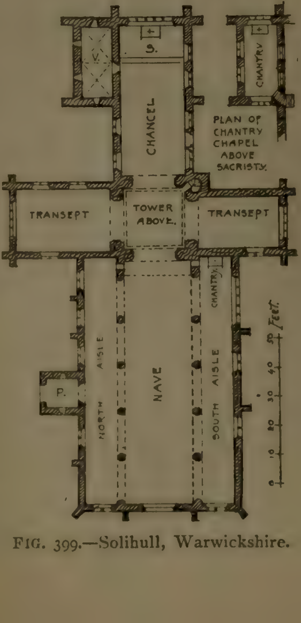


FIG. 399.—Solihull, Warwickshire.

(7) *Aisled Nave, Transepts, Unaisled Chancel (Western Tower).*

Such is the plan of Heckington (Fig. 107), Sall, and is a type of parish church in the early XIVth century when built completely afresh and on ambitious lines.

(8) *Aisled Nave and Chancel, Projecting Unaisled Sanctuary (Western Tower),—e.g.*, Southwold. (Figs. 236, 237.)

Of this type are many of the later XIVth-, XVth-, and XVIth-century churches. Usually the prolongation of the aisles eastwards originates through the foundation of private chantries belonging to local magnates, as at Lavenham, or by the addition of gild chapels, and consequently are later accretions to churches planned as in class (5). Sometimes one side of the chancel alone is aisled—for example, on the north at Ewerby, Lincs.; Fressingfield, Suffolk: on the south at Raunds, Northants.; Marston, Beds.: at Merstham, Surrey, the north aisle or chapel is Decorated, while the southern is Perpendicular.

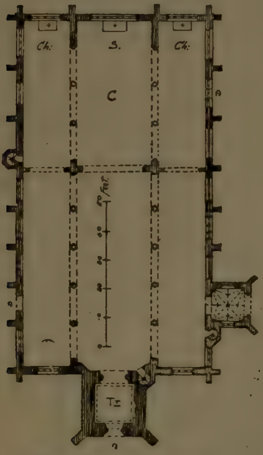


FIG. 400.—Coggeshall.

(9) *Nave and Chancel Fully Aisled (Western Tower).* (Fig. 400.)

This is an extension of the previous class (8), as at Grantham, Louth (Lincs.), and Coggeshall. Thaxted is even more magnificent with transepts and lateral porches. St. Laurence (Thanet), Rye, Old Basing (Hants.) and Hull, are examples of fully-aisled churches with central towers.

(10) *With Nave and Chancel under One Roof (Western Tower).*

The origin of this at St. Nicholas, Lynn, has been noted on page 298, and is the last form the parish church plan assumes, the chancel being either partially or fully aisled, as in classes (8) and (9). In churches such as Long Melford, Southwold, and St. Peter Mancroft (Norwich), the chancel arch, wall, and gable are suppressed, and the only division between laity and clergy is effected by a screen, much as in the northern episcopal plan (page 140) of the greater churches. This type is, in a way, a reversion to the early basilican plan (minus apse and transepts), but in a glorified form.

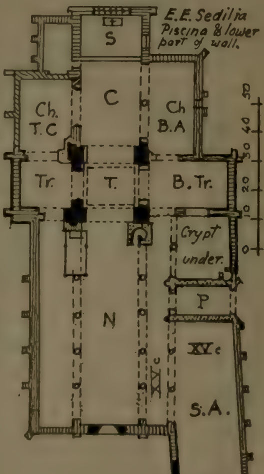


FIG. 401.—Burford.

REFERENCES :—

T.C.—Tanfield chapel.
B.A.—Bartholomew aisle.
S.A.—Sylvester aisle.
B.TR.—Burgess transept.
TR.—North transept.

(11) *Irregular Plans formed by Accretion.*

As at Burford (Fig. 401), Henley. The preceding types we have been studying are regular in treatment, but this resultant symmetry of form is far from being normal in parish church building. At the same time irregular plans are far more vividly expressive of the conditions and circumstances causative of the plan development of parochial ordinance. Accretion came by the piecemeal enlargement of an earlier fabric, it may be by chancel or nave extension, or by additions of aisles, transepts and chantries, porches, sacristies, and towers, when and where required. The building of these chantries—their purpose and use, have already been noted (page 304)—are the most fertile source of structural overlay, often radically affecting the aspect of the structure, and in common with later alterations, blotting out its original ordinance, resulting often in a chronological puzzle of structure difficult to solve. As a simple example of growth at Bredon (Fig. 402), the Norman axial tower now stands between an extended Decorated chancel to the east, and the original nave which has been enlarged by the Early English south aisle and the Decorated north aisle. At Burford, the projecting aisle to the south-west was originally a detached structure. Rebuilt and extended, it was ultimately incorporated into the body of the church, when the nave and aisles were reconstructed and enlarged in Perpen-

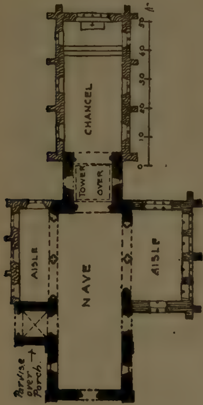


FIG. 402.—Bredon, Worcestershire.

dicular times. Dorchester (Oxfordshire) is an example of an abbey church altered and added to by accretions quite in the parochial manner.

Analysis of the Periods.—It is interesting to compare the complex bay design of the abbey or cathedral with the modest ordinance of the parish church, as this well shows how these diverse types of structure ultimately converged in ideal, each borrowing of each; the former simplifying itself, the latter becoming more ambitious. In this aspect, Ely Cathedral and Iffley Church have little in common; Bath Abbey and Blythburgh (except for the vault) are not so dissimilar. Indeed the ordinance of the naves of Canterbury and Ripon and many other Perpendicular examples are markedly parochial in character.

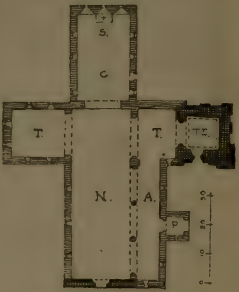


FIG. 403.—Clymping, Sussex.

We have seen how the parish church grew and expanded horizontally in plan, it at the same time developed vertically, in cross section and bay design. As we have noted before, the bay is the constituent cell or unit of design, and in a parochial aisleless nave this simply consisted of a portion of wall pierced by a window and supporting a wood roof. (Figs. 404, 405.)

Norman churches are usually aisleless, oblong, double- or triple-celled structures of moderate scale, with short, square-planned chancels, and possibly an apsed end as at East Ham, Newhaven; the towers, if any, are "axial" (Stewkley), more rarely "western,"

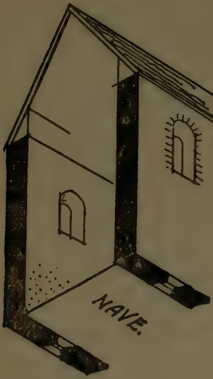


FIG. 404.
Saxon Parochial
Bay Structure.

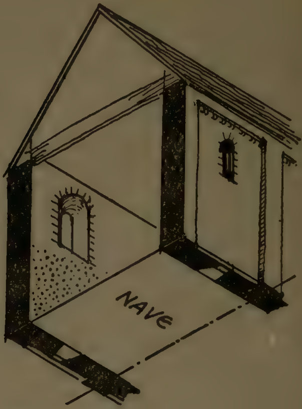


FIG. 405.
Anglo-Norman Parochial
Bay Structure.

and in more important examples the "central" tower

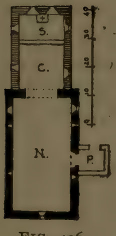


FIG. 406.
Tangmere,
Sussex.

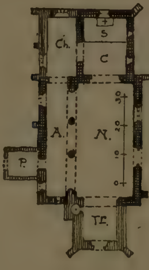
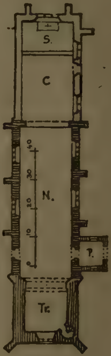


FIG. 407.
Barnwood,
Gloucester.

FIG. 408.
Morley,
St. Botolph,
Norfolk.



rises from the aisleless cruciform plan. Aisles to the nave of coeval date are rare in parish churches till the end of the XIIth century. (Figs. 407, 410.)

During the Transition the structural distinction between sanctuary and choir space is suppressed, the chancels lengthen, the square east end definitely now has superseded the apse, porches and western towers come into use, and narrow and low aisles are found divided from the nave by a low and heavy pier arcade, *e.g.*, St. Margaret's at-Cliffe, Kent ; Barnwood. (Fig. 407.)

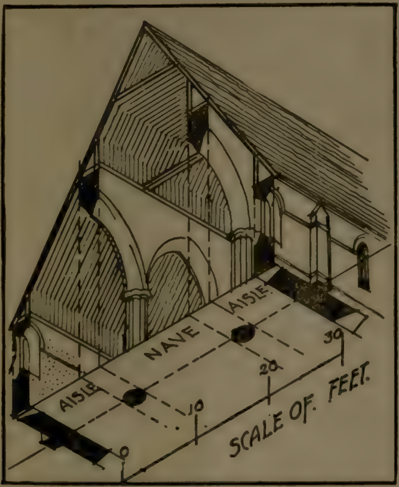


FIG. 409.—Skelton, Yorks.
Isometric Diagram of Structure.

In the early-XIIIth century, parish church design develops, and the aisled nave becomes henceforth the standard type of plan ; aisles, where not originally integral parts of the design, are added to earlier structures by way of extension. Clear-stories are usually absent; where the aisle roofs are not merely "lean-to" (Fig. 414), the nave roof is continued down over the aisles as at Skelton (Fig. 409), which are often narrow, low, and dark. The pier arcade is lighter and more graceful. Early English chancels have quite a character of their own—long and low, and lancet-lighted, as at Chipstead, Tangmere, Cherry Hinton; and more ambitious still, at Brecon and Broadwater. Elongated plans of the type of Fig. 408, as at Flempton, Suffolk; Lawford, Essex; are indicative of an original foundation of early date and subsequent extensions.

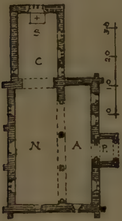


FIG. 410.
Whitwell, Rutland.

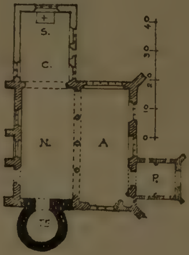


FIG. 411.
Rickinghall, Suffolk.

From Northamptonshire and the district near, came the impulse which did so much to fashion the ordinance of the English parish church throughout the XIIIth century. Here was adopted the western tower, crowned with its stone spire, which ousted the central steeple from favour. (Figs. 142, 193, 210.)

During the Geometrical period the pier arcades become lighter, loftier, and wider, as at Stone (Fig. 412); the aisles become more important. Low clear-stories are introduced (as earlier, at Elm (Fig. 414), Warmington, West Walton), though these are not common, the nave usually depending on the ever-widening aisle windows for light.

Where aisles had been built too wide to be roofed as lean-to, they had been constructed with span roofs and as *parallel naves*. This was eminently parochial in ideal. It was the inconvenience of the continuous central gutters liable to be choked and to overflow, as well as the inadequate lighting of the mid-nave, which emphasised the advantage of the monastic type of design with clear-story and flat lean-to roofs. (Compare Figs. 398, 412, 415.)

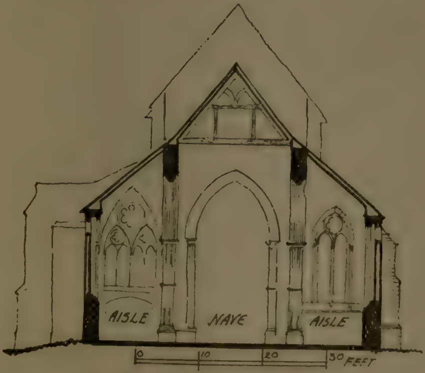


FIG. 412.—Stone Church, Kent. Nave.

The increase of scale in parochial work is especially notable in the Decorated period. Both naves and chancels become wider and more spacious, the pier arcades are loftier, though clear-stories usually remain low (Fig. 414); and in examples of complete rebuilding, such as Heckington and Patrington, the churches are truly magnificent. The chancels, in some cases, are partially aisled, and the accretion of chantries begins. Spires are lofty, with parapets and pinnacles; the elaboration of roof structure commences, and richly-carved fittings, such as sedilia, screens, Easter sepulchres, are provided.

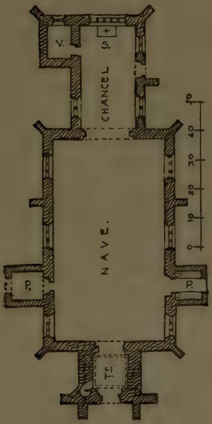


FIG. 413.
Elsing, Norfolk.

A type of plan, developed from class (2), with unaisled nave and chancel, which are exceptionally wide and spacious, as at Elsing, Norfolk; Raydon, Suffolk; is sometimes met with.

Other characteristic churches of this period are, Holbeach, Boston, Snettisham, Hingham, Nantwich, and Hull.

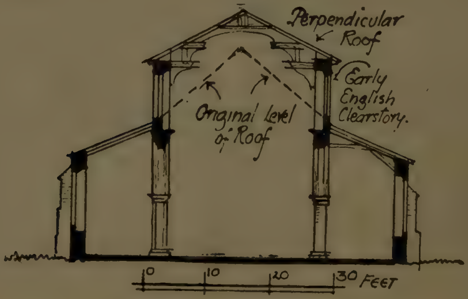


FIG. 414.—Elm, Cambridgeshire. Nave.

The culmination of parochial art takes place in Perpendicular times, concurrently with a simplification of structural ordinance and a rich elaboration of detail. The naves are lengthened, and pier arcades become ever loftier and more dignified in proportion, as at St. James', Bury St. Edmunds. Ranges of tall, closely set clear-story windows are built, often on an earlier pier arcade, *e.g.*, Gedney (Fig. 415), as in like

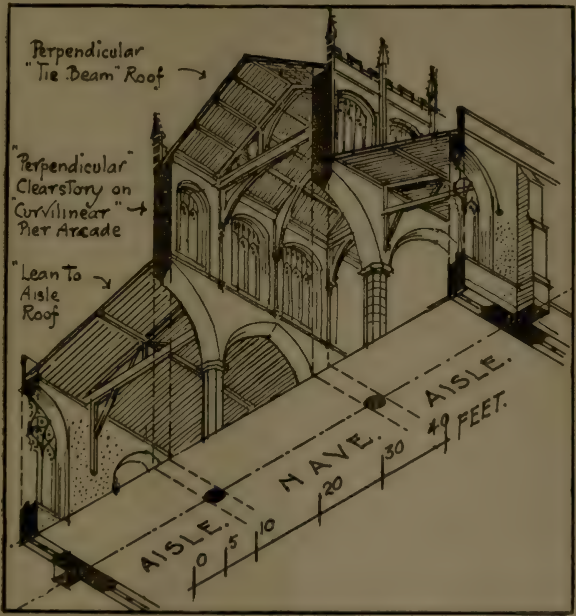

Perpendicular "Tie Beam" Roof
"Perpendicular" Clearstory on "Curvilinear" Pier Arcade
"Lean To Aisle Roof
AISLE.
NAVE.
AISLE.
0
5
10
20
30
40 FEET.

FIG. 415.—Gedney, Lincs.
Isometric Diagram of Structure.
Curvilinear Nave with Perpendicular Clear-story.

manner wide windows are inserted in earlier walls. Aisles are spacious and lofty, often running the full length of the church; roofs become ever more elaborate, and with the flattening of their pitches, the ordinance of cross-section and bay design approaches that shown in Figs. 238, 416.

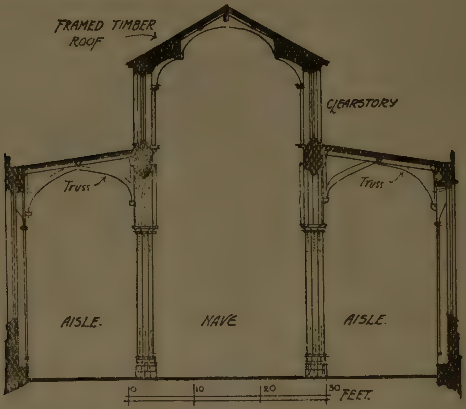


FIG. 416.—St. Peter Mancroft, Norwich.

Western towers, massive and usually unspired, vaulted porches with parvises over, chantry chapels, and sometimes duplicated aisles, are built around and about an earlier fabric; while internally the edifices were enriched with costly screens, stalls and fittings, fonts and font covers, stained glass, and painting.

At this time wooden benches came into general use in the nave for the seating of the laity; often these were elaborately carved, square-topped in the West of England, crowned with quaintly carved "poppy heads" in East Anglia (Fig. 226). Previously the only seats for the aged or infirm had been the stone benches running along the outer walls,—hence the saying anent "The weakest go to the wall." Many of these yet remain, as at Ufford, Northants.; Patrington, Yorks.; Hunstanton and Snettisham, Norfolk. Chipstead, Surrey; and Warmington, Northants.; have stone seats in the chancel, while at Sutton Bonington, Notts., the bases of the nave piers spread out as seats.

The principal schools or districts during this period where activity is most marked and the output singularly notable, are East Anglia, Somerset, and Devon. (Fig. 192.)

Lavenham, Louth, Long Melford, St. Stephen and St. Peter Mancroft, Norwich; Coventry, Fotheringhay, Collumpton, Tiverton, Kenton—to name a few—are all typical churches; but complete examples of style, such as these, are even less important witnesses to the spirit and enthusiasm of the XVth and early-XVIth centuries than is the mass of work carried out at this time in the innumerable piecemeal rebuilding, additions or alterations, to the parish churches throughout England.

Such, then, is an outline of the development of the mere structural shell, and it is outside the scope of the present volume to deal with the liturgical requirements and ecclesiological aspect of the Parish Church, which are of themselves a very fascinating branch of study.

These, together with an account of ecclesiastical fittings, furniture, and vestments, will form the subject of a later volume of the present series.

INDEX.

EXPLANATION OF ABBREVIATIONS.

Figures in heavy type indicate pages where descriptions or definitions of subjects can be found.

P* indicates Plan, and is placed *after* pages given.

Pl. ,, Plate ,, ,,

* after Figures indicates Illustrations at pages given.

Styles are contracted thus:—

Romanesque—Rom.
Saxon—Sax.
Anglo-Norman—A.-N.
Transitional—Trans.
Early English—E.E.
Geometrical—Geom.
Decorated—Dec.
Perpendicular—Perp.

A.

Abacus, 198*, 476*, 477; A.-N., 118*; angular, 164, 170*; circular, 146, 165*, 166*; concave-sided, 480; Dec., 478; E.E., 477; Geom., 477, 478; Perp., 314, 478; Rom., 477; square-edged, 165, 476*; square-planned, 164, 166; XIIIth-century, 209, 232*; Trans., 477; undercut ogee, 479, (15)*; undercut scroll, 479, (13)*

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